PRIMARY TEACHERS' PERCEPTIONS OF POLICY FOR CURRICULUM REFORM IN CYPRUS WITH SPECIAL REFERENCE TO MATHEMATICS

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for the Degree of Ph.D.

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June 1994

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ACKNOWLEDGEMENTS

I should like to express my gratitude to all those people who have contributed towards the completion of this research. I acknowledge the support given by the Director of Primary Education and the inspectors of Primary Education in Cyprus in providing important information and evidence for my research. My efforts before, during and after the years it took me to complete this study were patiently monitored by Jim Campbell, Professor in the Department of Education at the University of Warwick; my grateful thanks are extended towards him who has been both a friend and an excellent guide and adviser. I am also much indebted to the headteachers and the classteachers of the five schools who cooperated in this study, and most especially to the classteachers for answering the questionnaire and giving interviews which provided me with their valuable suggestions and comments. Many thanks are also extended towards the Cypriot teachers, the graduates of the Pedagogical Academy of Cyprus and the graduates of the University of Warwick who very willingly and promptly answered my questionnaire as well as those who co-operated during the interview. The research recorded in this thesis has been funded by the "A.G. Leventis Foundation" and by the Overseas Research Students Awards Scheme. Their support is gratefully acknowledged. I must express my sincere thanks to Mrs. S. Loucas, Mrs A. Englezaki and Mr J. Yiannakis who have assisted me to make the presentation of this thesis possible. Finally, I should like to express my gratitude to my mother and my fiance for their encouragement and patience during the preparation of this thesis.

Leonidas Kyriakides
June 1994

Abstract

The thesis reports and analyses findings from an investigation into Cypriot teachers' perceptions of national policy for curriculum reform in primary schools, with special reference to teaching and assessment in Mathematics. Questionnaires were sent to three samples of teachers: a 10% sample of Cypriot teachers randomly selected from the total population (n=257); all teachers in five primary schools (n=51); all beginning teachers (n=123). The latter sample was compared with a sample of English beginning teachers. A response rate of 70% was obtained and statistical analysis was carried out by SPSS-X. Semi-structured interviews were conducted with 20 teachers, mainly as a form of triangulation.

There were seven main findings. First, curricular purposes concerning pupils' ability to solve investigations, and to gain mathematical knowledge were seen as equally important; and ability to talk about Mathematics the least important. Second, formative purposes of assessment were accorded most, and summative purposes least importance. Third, teachers agreed with active pedagogy and with the application of mathematics to other subjects. Fourth, they conceptualised assessment as natural part of teaching but paradoxically favoured formally structured techniques of assessment. Fifth, classroom organisation rarely met policy requirements for a balance of whole class, group and individual activities. Sixth, cluster analysis revealed the absence of a collective professional view of the process of curriculum change. Seventh, statistically significant differences in perceptions were associated with characteristics of the class taught but there was no whole school effect. Other influences on perceptions were professional and political.

Implications for the implementation of curriculum policy in Cyprus are discussed drawing on the theories of Nias and Fullan. It is argued that a revised policy, emphasising teacher participation and school-based development is needed and this would require a new conception of teacher professionalism. A heuristic model of curriculum change and a short term strategy for curriculum change are outlined.

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Chapter 1 : Statement of the Research Problem

Teachers' perceptions of policies for curriculum reform are important because the failure of most innovations has been attributed to the neglect by innovators of teachers' perceptions (Fullan 1991, Sutherland 1981 and Nisbet 1973). In Cyprus in 1981, a reform programme (the 'New Curriculum') was introduced using a centre-periphery model of change (Anastasiades 1979, Karagieorges 1986, Kyriakides 1992). In 1992 a further programme of reform, also called the 'New Curriculum', was designed to bring about changes to all subjects in the primary curriculum. The details of these changes are analysed in Chapter 3, and mainly concerned content, pedagogy and assessment. In 1992, as in 1981, the centre-periphery model was used, with the central government, through inter-departmental committees, drawing up syllabuses, curricula, and planning guides ("triminiaia"), which were distributed to schools. There was no coherent inservice training associated with the reform programme. In this context, the research problem was to collect evidence about teachers' perceptions of the reform programme, and to examine the extent to which the perceptions matched the objectives of the reforms.

It was decided to take one subject, Mathematics, as an illustration of the reforms, and to investigate teachers' perceptions in detail in this subject. Mathematics was chosen because it is a core subject and relatively culturally free (Phillipps 1986, p. 67). It was, therefore, possible to compare perceptions of teaching Mathematics held by teachers in different countries.

This chapter outlines the research objectives, the methods used, and the samples involved.

The research has the following three objectives:

a) To investigate Cypriot teachers' perceptions of aspects of the reform programme in Mathematics in Primary school, with particular reference to curricular objectives, pedagogy and assessment. There is very little research conducted in Cyprus and this is the first time such research has been undertaken. Thus, a subsidiary objective of this research is to provide a descriptive account of Cypriot primary teachers' perceptions of curriculum policy for later research focused upon changes of teachers' perceptions.

b) to investigate the professional and political influences upon teachers' perceptions, with particular reference to training and length of teaching experience, school policies for the curriculum, and state control.

c) to draw implications from the research for improving reform policy in Cyprus, by relating the findings to theories of teacher development and professionalism and proposing strategies incorporating teachers' perceptions, rather than excluding them.

A brief description of the methods to achieve these objectives is provided below. As far as the first objective is concerned, an analysis of the responses of a randomly selected 10% sample of Cypriot teachers to a questionnaire was carried out, in order to establish a representative picture of the perceptions of primary teachers in Cyprus. In addition, it was possible thereby to examine some aspects

of the second objective, by analysing the influence of differences in professional training and length and nature of professional experience.

For the second objective, two other samples of Cypriot teachers were drawn. The first was all the teachers in five large schools, in order to examine the influence of within-school factors, particularly the role of school-based curriculum policies. The second sample comprised all the beginning teachers starting teaching in 1991, in order to examine the influence of initial teacher training, and to enable comparisons to be made with the 10% sample mentioned above. A further analysis was undertaken by comparing beginning teachers' responses with the responses of a sample of beginning primary teachers in England, in order to examine differences in perceptions arising from the national and political contexts in which the reforms were being implemented. In particular differences in the extent of central control could be examined in this way.

The third objective is realised through the application of the findings to the existing model of change in Cyprus. The development of a model which shows the complexity of the process of curriculum change and the development of professional networks incorporating and valuing teachers' perceptions are explored as ways towards an improved policy for effective curriculum change.

Summary

The objectives of this research can be stated as the following null hypotheses.

There is no statistically significant difference between the perceptions of curriculum reform in Mathematics among the following groups:

a) Cypriot teachers with more than 10 years of experience and those with less than 10 years.

b) Cypriot teachers who hold post-experience qualifications in Mathematics and/or Education with those who do not hold such qualifications.

c) Cypriot teachers who teach different year groups

d) Cypriot teachers who teach pupils of the same year group and those who teach to two different year groups of pupils.

e) Cypriot teachers who teach at Cycle A (composed of children of first, second and third year) with those who teach at Cycle B (composed of children of fourth, fifth and sixth year).

f) Overall perceptions of teachers who work at any one school with overall perceptions of teachers who work at any of the other four schools.

g) The randomly selected sample of 10% of Cypriot teachers with the group of Cypriot teachers who work at the five schools.

h) Cypriot beginning teachers when they were at the end of their training (February 1991) and at the end of their first year of teaching experience (April 1992).

i) Cypriot beginning teachers with the rest Cypriot teachers.

j) Cypriot beginning teachers with Cypriot teachers who have less than 10 years of teaching experience

k) Cypriot Beginning teachers with teachers who have more than 10 years of experience

l) English beginning teachers from Warwick University when they were at the end of their training (March 1992) and at the end of their first year of teaching experience (April 1993)

m) Cypriot beginning teachers with beginning teachers from Warwick University.

In addition the correlations between their perceptions about the purposes of assessment with those about teaching and assessment in Mathematics will be examined. A thorough description of the research design is provided at Chapter 4.

CHAPTER 2: CURRICULUM POLICY IN ENGLAND AND CYPRUS

The first part of this chapter provides an examination of the major issues of curriculum policy in Cyprus in respect of teaching and assessment in Mathematics. An analysis of the context of the educational system in Cyprus is also provided (section 1.1) to understand curriculum policy fully (section 1.2) and thereby to produce a critical analysis. This analysis reveals eleven problematic areas of policy in primary Mathematics in Cyprus (section 1.3). The second part of this chapter is concerned with curriculum policy in England. Five major issues of teaching and assessment in Mathematics as they are reflected in the National Curriculum and various documents are analysed (section 2.2) and a critical analysis of English curriculum policy is provided in the last section (2.3) of this chapter. A comparison of the problematic areas of the English curriculum policy with those of the Cypriot curriculum policy is also attempted by reference to the differences in the context of the Cypriot and English educational systems. The issues of curriculum policy in Cyprus and England discussed in this chapter provide the basis for the design of the questionnaire to teachers (see Chapter 4).

1. Curriculum Policy in Cyprus

This section attempts to identify the major issues in the curriculum policy in Cyprus in respect of teaching and

assessment of Mathematics as they are reflected in the New Curriculum (Ministry of Education 1992a), the guidelines published by the interdepartmental committee to support teachers with the implementation of the curriculum (Boithema Ylopoieses Analytikou Programmatos) (BODAPE) and all documents of the Cypriot Ministry of Education since 1989 about the new primary curriculum and the Mathematics curriculum. These amounted to 22 documents, and are listed in Appendix F.

However, in order to understand curriculum policy in Cyprus fully, and identify its implications for the theory of curriculum change, it is necessary to deal with the context of the educational system in Cyprus. This context can be analysed into those specific political, social, cultural and economic factors which influence education in Cyprus (Section 1.1). The reason for this approach is given by Ukeje (1980, p.39), who claimed that: "education is inevitably influenced by the political, social, economic, religious climates of the time and place". Such factors are commonly seen as influential on curriculum policy (Lawton 1983, 1989, 1992) whether as the sources of curriculum change or as barriers to change (Howson et al 1981). The influence of these factors upon the development of 1992 curriculum reform policy, as it is reflected in policy documents, is illustrated in the second section of the first part of this chapter (1.2) and a critical analysis of curriculum policy is provided in the last section (1.3).

1.1) The Context of the Educational System

A) The Effect of Socio-Political Factors: Development of a Centralised System.

One of the main characteristics of the educational system in Cyprus is that its administration was, and continues to be, centralised and the schools are still considered as governmental, and not as community, institutions. The reasons for this are the historical and political factors which influenced the development of the system and people's expectations for it.

The establishment of a centralised system and the political purposes of the British Colonial government

The basic foundations of the Cypriot educational system were established when the British came to Cyprus (Karagiorges 1986) and since the date of the first circular (16th July 1881) the system of primary education was gradually subject to centralised control through a successive series of laws enacted from 1896 to 1949. The educational law of 1933 established the British Governor of the island as the controller in educational matters (Tornaritis 1959, p.7). The extent of this control was criticised by Spyridakis (1954) as follows:

> "The centralised powers given by it to the Governor and the Director of Education have reached such a point as to be without precedent and surpass the most pessimistic prognostications. Not only do the teachers depend on the government absolutely, not only is the curriculum ordained by it, but the smallest detail, down to the erection and repair of latrines, must be done with the approval of the director of education" (p. 16).

It is however important to identify the reasons why English government in Cyprus moved towards a centralised system in

contrast to the decentralised system developed in England in the same period (Lawton 1980). Anastasiades (1980, p.37) indicated that a change to a centralised system fitted the needs of the colonial powers. When the British colonial government undertook the administration of Cyprus in 1878, it found in it Greek education based on assumptions operating in the Greek state. A centralised system could be therefore used to allow the government to control the education in order to anglicise the Cypriot primary schools. This had negative implications for the relations of the government with the Orthodox church due to their different interests reflected in their different expectations from education.

The Orthodox Church of Cyprus showed a considerable interest in education during the British administration, formulating an educational philosophy which described education as an intrinsic good, as something closely related to religion, and as something which created moral men and patriots. Persianis (1978) showed that because of the special political conditions prevailing in Cyprus, the church's educational philosophy was particularly influential. Education was therefore seen as intended to strengthen the national feelings, and therefore, it could be interpreted as subversive of colonial power. The ideology of the British colonial government in Cyprus differed substantially from that of the Orthodox Church and was the main reason why the colonial government established a centralised system designed to enable them to control education.

Throughout the period of British rule teachers were seen by the people as quasi-political agents in the villages; they taught the pupils that they were Greeks and promoted the idea of union with Greece. This political role of teachers reinforced the British colonial government's decision to control teachers and to prevent them acting on behalf of the Orthodox church. The fact that legally the classification and promotion of teachers, and the right of disciplinary punishment and dismissal lay with the government, typified this approach to control. Spyridakis (1954, p.19) cites the case of a teacher who was punished because a Greek flag had been found painted on a pupil's desk. This attempt of government to exercise control over the ideology promoted in schools was also reflected in the 1949 curriculum (Government of Cyprus 1949) which laid down the objectives of teaching and omitted reference to education for national identity. In addition, the teaching of English occupied the same place as the teaching of Mathematics in the curriculum in line with the government's attempt to anglicise primary schools. Most explicitly the 1949 curriculum forbade the use of maps of Cyprus together with the other Greek lands, so as to discourage teachers from promoting the idea of unification with Greece.

Political factors in the period after Independence

For the Greek Cypriots, the educational system continued under centralised control in the period after independence in 1960, although in effect two parallel centralised administrative systems of education were established based on two religions and cultures without any link between them,

but both serving political purposes. Greek Cypriots were looking for the unification of Cyprus with Greece (Spyridakis 1967, p. 2) whereas Turkish Cypriots for the division of Cyprus into two separate parts. Thus, through a centralised system each national group could control its curriculum and develop an education directed towards its own national and political purposes. Moreover, the relationship of the Orthodox church to the state had changed in 1960, reflected by the fact that Archbishop Makarios was both a political and religious leader. Thus, the church which had previously challenged the centralised system, became in that period a force for its conservation.

Social factors maintaining a centralised system in 1960s

Beyond the political factors, there were some social factors helping to maintain a centralised system in Cyprus. First, in 1960s inspectors and members of the "Greek Communal Chamber" did not have any experience of systems other than a centralised one. (On the basis of Zurich and London Agreements, Education was separated and put under two communal chambers and according to Article 87 the Greek Communal Chamber had competence to exercise "legislative power solely with regard to all educational, cultural and teaching matters" of the Greek Cypriot community). In addition, the strong link of Cyprus with Greece drove the Greek Cypriot policy-makers to look to the Greek system as a model, and this also was a centralised system (Persianis 1978, p. 40). Similarly Turkish Cypriots looked to the Turkish system (Crellin 1981) which was also centralised. Finally, there was a strong economic factor; Cyprus needed

to raise general standards of education in the shortest possible time. And since the majority of the population were not well educated, local community leaders were generally lacking so that a decentralised system was not possible.

Social factors maintaining a centralised system in 1990s

Education administration is still centralised, and according to the law 12/65 all the administrative functions of the Greek Communal Chamber were transferred to the Ministry of Education. Thus, primary education is under the authority of the Ministry of Education. The maintenance of the centralised system can be attributed to the fact that a decentralised system in a small country like Cyprus would be very demanding in manpower. With no more than 367 schools and only 2700 teachers in the primary school system, it has the same administrative range as a large English Local Educational Authority. Thus, social factors identified above still influence the maintenance of the centralised system. In addition, the fact that teachers do not have any experience of systems other than a centralised one restricts the potential for change and does not help teachers to perceive the need for changing the structure of the system. This is an argument which is further explored by this study.

However, inspectors and Ministers of Education in different periods identified the negative effect of a centralised system. A typical example of this is that in a speech before the House of Representatives, the then Minister of education (Sophianos 1978, p. 17) recognised that there were

disadvantages from the absolute centralisation of the educational system in Cyprus without specifying them. In addition, inspectors (Pantelides 1986, Poludorou 1986, Theodorou, 1986) have argued that teachers should be involved more actively in the process of curriculum change. Their opinions were presented in a conference on the teacher's role in education organised by the teachers' trade union (POED) in 1986, but primary teachers as a professional group were not consulted about the design of the new curriculum (Ministry of Education 1991a; and 1992b, para 6).

B) Cultural Factors.

Coherent Culture based on Greek Orthodox Civilisation

The influence of culture on education can be seen in terms of its role for the development of people's attitudes and expectations for it. Cypriots' perceptions of education can be identified in the analysis of the educational philosophy promoted by Greek Orthodox Church presented above (p. 9). These perceptions are linked with the fact that Cyprus has been an outpost of Hellenicism since its beginning and one of the first Christian Orthodox communities. Education has been therefore heavily engaged in preserving a national and cultural conscience and a Greek and Christian Orthodox identity. This has had an effect on the development of at least three of the ideologies of the Greek educational policy in Cyprus. These are nationalism, humanism, concerned with the intensive study of Ancient Greek literature, and idealism which was derived from Plato and Aristotle and reinforced by Christianity (Persianis 1981). This coherent culture created a single general purpose for

Education (see p. 22). Thus, agreement on the general purpose of education could be achieved relatively easily so that the adoption of a centralised system was reinforced.

C) Cultural and Economic Factors.

Perceived Importance of Education

Cypriots have a high regard for education since they perceive education as a means of economic survival and promoting their own coherent culture. However, this perception of education can also be linked with the significant role which the economy of the island played in the development of people's attitudes to education. Until the early 1960s a poor child who finished a secondary school could get a post as a teacher or a civil servant and could easily join the middle class. His/her socio-economic status could be higher if he/she managed to obtain a University degree. Education was in addition intrinsically respected as learning and wisdom (Persianis 1981). This contributed to the rapid expansion of education in independent Cyprus. The percentage of those who finished the primary school rose from 56.6% in 1960 to 99.6% in 1992 and that of University graduates rose from 1.3% in 1960 to 36% in 1992 (Ministry of Finance 1992, Tables 2 and 3).

Although, nowadays educated people can not find work easily and are not always the most well-off members of society, due to the high rate of unemployment among University graduates, the distinction between educated (ie holder of a University degree) and non-educated (non-holder) is particularly important in Cyprus and equally as strong as the distinction

between rich and poor. This means that education is still highly esteemed.

At the practical level the effect of cultural factors can be seen in the fact that students receiving state education might also receive additional, mathematical tuition out of school funded by parents (Howson 1991). In addition, the effect of the ideologies presented above on policy on Mathematics can be seen in terms of the high perceived importance attached to Mathematics by inspectors, teachers, and pupils, and in the focus of the policy on Abstract Mathematics and Geometry. This focus can be attributed to the importance of Mathematics and especially Abstract Mathematics and Geometry amongst the Ancient Greeks (Kyriakides 1990a), and is reflected particularly in the secondary school Mathematics curriculum (Halls and Humphreys 1968, p. 29). Its effect upon Primary Mathematics can be seen in the curriculum of both 1981 and 1992 where Geometry and Abstract Mathematics are emphasised more than in those of other countries, for example in the National Curriculum of England and Wales.

Primary Teachers' Status

The perceived high importance of education and its effect upon Cypriot attitudes to the holders of university degrees mentioned above, are particularly important for teachers' status. The fact that primary teachers are seen as having lower status than secondary teachers can be attributed to these attitudes. Secondary teachers are considered as experts in their subjects since they are holders of a

university degree related to the specific subject which they have to teach. However primary teachers who have a degree acquired from a higher institution (Pedagogical Academy of Cyprus) (PAC) and not University have lower status and are not considered as experts since they teach several subjects. This distinction is reflected in their salary and their working conditions which are not the same.

Finally, although the term "teacher" in English covers all those who exercise the vocation of teaching, from the University professor to the teacher of infants, there are two different terms for primary and secondary teachers in Greek ("daskalos" and "kathigites" respectively). Because of all these cultural factors, a different status between primary and secondary teachers has developed which fails to emphasise their unity of purpose (Wedell 1971). This failure is particularly obvious in Cyprus, and Gurr's (1967) criticism that the departmentalisation was a main drawback of the system since it did not encourage interaction among the primary and secondary departments is still applicable. Gurr (1967, p. 87) concluded that:

> "The educational system is departmentalised with very little interplay between the departments. This applies not only to the separation of the system into separate entities of elementary schools, secondary schools and technical schools but to the separation of the teaching staff, the inspectorate and the administrative departments as well. Re-thinking of the educational philosophy behind this separation is desirable".

However, some economic factors may be altering the differential status of primary and secondary teachers. Although there is a high rate of unemployment among

University graduates in Cyprus, among primary teachers there is no unemployment; this is a particularly important factor contributing to the empowerment of primary teachers. Because of this factor primary student-teachers of the last eight years are those with the best academic achievement in secondary education (Kyriakides 1988). In addition, there is great competition among graduates of secondary schools to become primary student-teachers, and so that student-teachers have very high results in the entrance examination at the University (Ministry of Finance 1989, 1990, 1991, 1992). The consequence is that primary student-teachers have better academic background than their secondary counterparts.

D) External Influences: The International Context.

D1) Greek Influence.

The fact that a very similar culture can be identified in both Cyprus and Greece has implications for the relationship between the Greek educational system and the Greek Cypriot one. Apart from the similarities of the general purposes for primary education, the close relationship can be also identified in policy documents of the two ministries, revealing a series of agreements for co-operation between them (Ministry of Education 19921). The agreements provided for textbooks common to both systems, revealing the influence of the Greek system on the development of curriculum policy and curriculum practice in Cyprus (Ministry of Education 1985; 1992b, para 3.9; 1992c, para 3; 1992d para 3 and 19921). Moreover, during the design of the

new curriculum of Cyprus, Greek educationalists were used as consultants (Ministry of Education 1992e, p. 2).

D2) English Influence.

The English influence on the Cypriot curriculum policy during the period of the British rule was not restricted to the attempts of the British Colonial government to achieve its political aims. In 1947 model schools along English lines were set up in Cyprus, based on the idea that English teaching methods could be transplanted into Cyprus. Spyridakis (1954, p. 23) considered that the establishment of model schools was consistent with the principles of anglicising the primary school but this is a very restricted interpretation. The function of these schools was based on the implementation of English teaching methods by a few primary teachers who had followed a post-graduate course in England (Spyridakis 1954). It is important to take into account that teaching methods in Cypriot schools in late 1930s were mainly based on asking children to memorise from books (Cyprus, 1934). As a consequence, there was a need for creating a debate about pedagogical issues. This policy of the colonial government had therefore important implications for the development of a curriculum policy specifically focused on pedagogy.

The establishment of model schools by the colonial government had also a significant impact upon teachers' professional development which was very limited at that time. The fact that since then, teachers who were responsible for curriculum development had either training

in England, as in the case of Workcards in Mathematics (Kyriakides 1992), or were guided by a British expert (Karagiorges 1986, p. 88) shows the strong influence of English practice upon the Cypriot curriculum policy.

The English influence upon curriculum policy was not only significant for the development of the policy in the late 40s; the methodology adopted in Cyprus in the late 70s was, and remains a mixture of ideas on pedagogy from the Plowden Report (CACE 1967), and control by the inspectors on matters of selection of content and evaluation (Theodorou 1980, p. 278).

The British influence can be also seen in terms of the continuous visits of English consultants on aspects of curriculum practice in Cyprus. More recently an expert from England (Foxman) visited Cyprus and presented to the members of the inter-departmental committee in Mathematics the English assessment policy in Mathematics. He exchanged ideas with them concerned with the development of assessment policy in Cyprus (Ministry of Education 1991b). The English influence can be most recently seen in the fact that the members of the inter-departmental committee took into account English policy documents (DES 1989d, NCC 1989a) and schemes published in England to create Cypriot policy documents and textbooks. The evidence for this is in a letter from the director of primary education (Ministry of Education 1989), and from unpublished interviews with Kyriakidou and Spanos, members of the committee which is responsible for the publication of the new textbooks. These

interviews were given to me as part of background preparation for this research.

D3) American (USA) Influence.

The USA has had a significant impact upon the development of Cypriot curriculum policy since most of the primary inspectors in Cyprus studied at American Universities and attended courses on curriculum development there. These inspectors are responsible for the design and evaluation of curriculum policy. This explains why inspectors follow "rational curriculum planning" models and the design of both the 1981 curriculum and the 1992 curriculum, were based on the Tyler's basic model and Taba's model (eg Ministry of Education 1992b, para 4) respectively. This model of the curriculum therefore was not adopted exclusively due to the centralisation of the system, as Theodorou (1980) suggested, but also because of the inspectors' training in curriculum development in the 1960s in America.

1.2) Analysis of Curriculum Documents.

The analysis of curriculum policy in Cyprus based on curriculum documents is problematic because there are no discussion or consultative documents exploring the issues of teaching and assessment raised by policy documents. Moreover, there is no secondary source for curriculum and assessment policy which could be used to analyse the policy documents. Thus, this review is search of primary sources.

However, interviews with inspectors who are responsible for the formation of policy have been used to support the analysis of the curriculum documents provided in this section. The use of both curriculum documents and interviews with those who designed the documents can be seen as a kind of triangulation since findings from one can be checked by findings from the other. Findings of these interviews are presented in Appendix A.

The unproblematic treatment of education policy in Cyprus is also influenced by the socio-political, cultural, and economic factors presented above. This influence will be explored in this section, in order to clarify the conceptions of policy issues supported by policy documents about the new curriculum and identify implications for the process of change followed in Cyprus. The implications are presented in the third chapter which is concerned with the management of change.

The following four issues have been identified in the Cypriot policy documents: a) Value assumptions of the educational system, b) Nature of Mathematics and its Curriculum, c) Pedagogy in Mathematics, and d) Assessment in Mathematics.

A) Value assumptions of the educational system

This part is concerned with the value assumptions of the educational system of Cyprus which are closely related to the culture of a Greek Orthodox society. It is argued here that policy documents acknowledged that curriculum should be

based on these value assumptions but their implications for the design of the curriculum of each subject were not provided.

The first section of the new curriculum of Cyprus (Ministry of Education, 1992a) deals with how education in Cyprus should be considered and indicates that the general purpose, the aims and the priorities of primary education in Cyprus should be linked with the societal needs and values promoted by the culture of a Greek Orthodox society. In addition, the Ministry of Education (1992a) claims that the general purpose of primary education in Cyprus should be defined by the government taking into account the common culture of the Cypriot society, the Orthodox religion, and the national and socio-economic needs of Cyprus. Finally, suggestions for how the general purpose of education should be defined are identical to those provided by the previous curriculum (Ministry of Education 1981). Thus, not only the value assumptions of the educational system but also the general purpose of education in Cyprus has remained unchanged. This purpose is illustrated in the second paragraph of both the new and previous curriculum. It is seen as:

> "the development of democratic citizens with a fully developed personality, mentally and morally refined, healthy, active and creative, who will contribute with their work and their conscientious activity in general to the social, scientific, economic, and cultural progress of Cyprus and to the promotion of the cooperation, mutual understanding and love among men and people for the prevalence of freedom, justice and peace (Ministry of Education 1981, and 1992a).

However, it is difficult to understand what is actually meant by the above ideas. Although both the previous curriculum (Ministry of Education 1981, paras 3-4) and the new one (Ministry of Education 1992a, pp 1-4) provide some explanations of such purposes, the implications for the curriculum of each subject are not indicated by any policy document. The policy documents attempt only to provide a theoretical analysis of aspects of this general purpose. The following three aspects emerged from the analysis of the general purpose.

First, a significant aspect of the general purpose of primary education, that is the notion of a democratic citizen, has been analysed further in a similar way by both the previous and the new curriculum policies. It has been claimed that the idea of democratisation should be seen in terms of: a) the respect for the dignity and uniqueness of each individual, b) the respect for the opinion of the majority, c) opportunities for participation in the decision making process d) the encouragement of cooperation and responsibility and e) the equality of opportunity in all aspects of social life. A similar analysis was provided by the latest report on Cypriot education prepared for the 42nd International Conference on Education (Ministry of Education, 1990a). Finally, most of the policy documents (eg Ministry of Education 1992f, para 2 and 1992g, p. 1) argue that this is a very important aspect of the general purpose of primary education. Thus, there is a very substantial agreement among the policy documents about this aspect of the general purpose of primary education.

There are, however, some differences concerning aims between the two curricula. First, the new curriculum of 1992 is focused on the national political problem of Cyprus and on the need for making children aware of the occupied area. This need is seen as essential for the maintenance of freedom, justice and peace in Cyprus, a view emerging also in policy documents dealing with the introduction of the new curriculum (Ministry of Education 1992b, para 2; and 1992f, para 2.1) but not in documents of the early 1980s.

This difference can be attributed to the crisis, after the Turkish invasion in 1974, in well established beliefs on which the entire educational policy was based for centuries. This crisis caused a conflict over Cypriotisation or Hellenisation (Karagiorges 1986, Kyriakides 1992, p. 27). Because of this conflict Ministers of Education at the end of 1970s (Mikelides 1975, Sophianos 1978) decided that the general purpose of primary education should not refer to the national problem of Cyprus, so any direct or indirect involvement with the conflict over Cypriotisation and Hellenisation could be avoided.

However, more recently, inspectors (see Appendix A) and parents (see Kyriakides 1990b) recognised that primary pupils should know about the national problem of Cyprus. In addition, the director of primary education argued that primary education in Cyprus should attempt to help pupils to identify their role as citizens of a "half-occupied" country (Leontiou 1987 and 1993). He also claimed that this had nothing to do with the ideological conflict over

Cypriotization and Hellenization. This concern with national identity can be therefore attributed to changes in the political climate which support the idea that the ideological conflict over Cypriotisation and Hellenisation is an issue entirely different from the national problem of Cyprus. Thus, the political function of the curriculum in Cyprus can be identified.

Second, a change in the interpretation of the general purpose can be also identified in references to different societal needs. Policy documents dealing with the introduction of the new curriculum of 1992 linked school needs with the intentions of government to become member of the EEC (Ministry of Education 1992a; 1992b, para 2.4; and 1992f para 2.4). It is also pointed out that this possibility should be linked with the changing demands of the 21st century.

Although the issues presented above are not restricted to teaching and assessment in Mathematics, there are implications for them, and these are discussed in the next section.

B) The nature of Mathematics and the Mathematics curriculum.

This section attempts to show that although the New Curriculum is dealing with the nature of Mathematics, there is no coherent policy about it. No policy document raised implications of the consideration of the nature of Mathematics provided by the new curriculum.

Both the 1981 curriculum and most of the policy documents do not deal directly with the nature of Mathematics. However, the section of the 1992 curriculum in Mathematics called "introduction" is concerned with the nature of Mathematics. It proposes a utilitarian nature for Mathematics (Ministry of Education, 1992g). It is suggested that the usefulness of Mathematics arises from the fact that it is fundamental to the study of physical sciences and technology and is now used in the study of social sciences. The perceived usefulness of mathematics related to the study of natural sciences can be also identified in Cockcroft report (DES 1982b, para 5).

Even though Mathematics is defined in this utilitarian way, there is an element in the discussion of the nature of Mathematics which is drawn directly from Cockcroft Report (DES 1982b, para 3) and has nothing to do with the utilitarian concept but with the perceived nature of Mathematics as language. Thus, Mathematics is considered as "a powerful, concise and unambiguous means of communication" (Ministry of Education 1992g). This might superficially be seen as a reflection of the special relationship of Cypriot curriculum policy with the English, except that the role of language in teaching Mathematics, emphasised in Cockcroft, was absent from the new curriculum.

Ministry of Education (1992h, para B.2) indicated that:

> "the new curriculum should provide explanations about: a) The reasons for which each subject should be taught, b) The content of each subject, c) The pedagogy of each subject, d) The teaching means which can be used for

carrying out the teaching of each subject. and e) Assessment of pupils' attainment in each subject."

Although the separate categories are helpful, a criticism of them is that the new curriculum in Mathematics (Ministry of Education 1992g) did not provide any link between these five aspects. There is also a discontinuity between its consideration of Mathematics as means of communication and its suggestions about the role of language in learning Mathematics. Finally, the policy documents did not attempt to link the purposes of teaching Mathematics promoted by the new curriculum with any consideration of the nature of Mathematics.

The explicit *purposes of teaching Mathematics promoted by* the New Curriculum (Ministry of Education 1992g) are that pupils should come to understand the structure of Mathematics, develop mathematical thinking and positive attitudes to Mathematics and explore their mathematical understanding through their own experiences from everyday life. Most of these purposes can be identified in both the curriculum of 1981 and in England (DES 1989d), as a comparison of these purposes with the National Curriculum ATs has shown (Kyriakides 1992, p. 80), except for the development of positive attitudes to Mathematics. This is in line with suggestions of the Cockcroft Report rather than the National Curriculum in England and Wales, and suggests a strong influence of the Cockcroft Report upon the new curriculum of 1992. Policy documents had supported the value of this purpose since 1977 (Ministry of Education 1977). However, no curriculum document identified any link between

the perceived nature of mathematics and the purposes and methods of teaching mathematics and this is in contrast to the Cockcroft Report.

Content and structure of the curriculum in Mathematics.

Although policy on purposes of teaching Mathematics is closely related to the structure of Mathematics, no document justifies the way various mathematical topics are presented in the new curriculum in the light of the nature of Mathematics. A typical example is the place of measurement in the new curriculum of 1992 as a separate topic which can be also identified in the previous curriculum (Ministry of Education 1981) and the oldest version of the National Curriculum (DES 1989d) but not in its revised version (DES 1991a). However, neither English nor Cypriot policy documents provided any justification for the way which these areas are presented (see p. 69).

Nevertheless, the structure of the new curriculum in Mathematics can be examined in terms of the *fact that* reports of the inter-departmental committee make explicit that children should be able to identify the holistic structure of Mathematics (Ministry of Education 1992g, 1992i). This implies that pupils should realise that the Mathematical concepts are interrelated. It can be, therefore, argued that there is an apparent policy contradiction since the 1992 curriculum approaches a topic on measurement and a topic concerned with the use of money as being isolated from other topics. This contradiction can

be also seen in the fact that decimal numbers and fractions are presented as two different topics.

Finally, problem-solving is presented as a topic separate from all the other mathematical topics like those of number, geometry and data handling. As a consequence several methods of problem-solving based on the mathematical theory of Polya (1969, 1973) are illustrated. In this sense the new curriculum of 1992 differs from the curriculum of 1981. However, the Ministry of Education (1992g, Appendix A, end note 1) indicates that this separation has been done to make people recognise the importance of problem-solving. This implies that the apparent contradiction between its approach to problem-solving and its perceived holistic structure of Mathematics *is acknowledged. Nevertheless, there is still* a question as to why policy documents do not mention anything about the contradiction between the way the other three mathematical areas (viz measurement, decimal numbers and fractions) are presented and the goal of recognising the holistic structure of Mathematics.

Only one policy document acknowledged that there was a contradiction between the design of the new curriculum and its support of the holistic structure of Mathematics (Ministry of Education 1992i). It suggested that this contradiction had to do with the lack of a policy on cross-curricular approaches in Mathematics. However, the term cross-curricular approach is misconceived in this document since it is defined as teaching several Mathematical topics (ie numbers, operations and problem solving) together rather

than in isolation. There is little link between Mathematics and other subjects in policy documents. This has implications for the conceptions of cross-curricular approaches in Mathematics which have not been raised by any policy document. This is despite the fact that primary schools in Cyprus have specific timetables which reinforce separate subject teaching, and thereby makes that need for clarity about cross-curricular approaches particularly important. Similarly, cross-curricular approaches do not feature in the BODAPE.

There is a final issue indirectly related to the lack of a coherent policy on the nature of Mathematics. Although the large proportion of curriculum time (18%), which teachers are *obliged to spend in teaching Mathematics, has been* identified by policy documents (Ministry of Education 1991c, Georgiou 1993) which thereby reinforce the status of the subject, as is the case world wide (Meyer et al 1992), there is no explicit justification for treating Mathematics as a core subject.

C) Pedagogy

An explicit pedagogy is promoted by both the previous and the new curriculum. However, the former is concerned with pedagogical issues of each subject separately, whereas the latter provides issues of pedagogy common for all the subjects. The second section of the introduction of both the previous and the new curriculum refer to Piagetian theory. This is particularly important in the case of Mathematics since Post-Piagetian theory (Hughes 1986) is

ignored, and it illustrates some policy confusion since the Ministry of Education (1981, 1991d, 1992a, 1992b, 1992g, and 1992h) argued that change in Mathematics should come from new theories of psychology.

The third section of the new curriculum provides implications for teaching methods. Its first paragraph indicates that no one teaching method can be seen as the most effective and it is suggested that teachers should use mixed methods. A similar position is discussed in Alexander et al (1992) in respect of English teachers. However, it is in contrast with the progressive pedagogy promoted by the previous curriculum, by the inspectors (Appendix A) and even by some policy documents concerned with the introduction of the new curriculum (Ministry of Education 1992b, para 3.1; and 1992k) in which it is strongly argued that Mathematics should be taught through practical investigations.

The following four issues raised by the new curriculum of 1992 are also promoted by English policy documents (see Section 2.2 below). First, teachers should provide opportunities for practical and investigative tasks. This is an issue supported since 1977, according to policy documents published in late 1970s (Ministry of Education 1977, 1979, 1980, 1981) which also features in the BODAPE. Second, they should develop flexible ways of working as a class, in groups or individuals. The new curriculum of Cyprus (Ministry of Education 1992a, p.13) indicates that "teachers should give particular attention to providing children with tasks for small groups working co-operatively"

and to "providing differentiated tasks according to the level of difficulty and individual tasks". However, policy documents did not provide any suggestion on how this could be done and BODAPE is not concerned with classroom organisation. Third, the development of good relations with children is strongly emphasised. Teachers are expected to create

> "... a joyful, happy, safe, healthy, familiar, motivated environment. Teachers should give to each child opportunities for success and motivate his/her effort. They have to develop a classroom ethos based on emulation and not on competition" (Ministry of Education 1992a, p. 12).

Finally, the development of children's skill in using calculators and computers is not established in the curriculum or BODAPE or textbooks. The lack of any policy related to information technology in Mathematics in Cyprus is partly because of different socio-economic needs and financial implications for resource allocation in primary schools in Cyprus. This issue is further explored in the next section taking into account findings from interviews with inspectors.

Three other pedagogical issues are specific to Cyprus policy. First, teachers are expected to apply their teaching to the school environment and the broader environment of children through visits. Second, teaching activities asking children to observe, to do interviews, to listen, to present their work, to explain their opinions, to discuss with other pupils and construct maps, diagrams,

statistical tables and models should be provided. And third, the use of books and other reference sources is suggested.

D) Assessment in Mathematics

The essential difference between the previous and the new curriculum is that a section of the new curriculum is focused on assessment. This section can be seen as the first systematic attempt of the inter-departmental committee to establish the base upon which assessment in Cyprus can be developed. Until recently assessment was a neglected issue restricted to two attempts to investigate the standards in Mathematics (Papaioannou 1979, 1981). The findings of these investigations have never been disseminated. The new curriculum therefore reflects a new policy in assessment.

Analysis of the policy documents identified 12 issues.

1) Assessment policy is coherent across the different subjects whereas previously assessment issues were explicitly related to different subjects.

2) Although policy documents do not refer explicitly to the purposes of assessment, formative assessment is emphasised, whereas summative assessment is ignored, probably because of fear of labelling (Ministry of Education 1992a, para 3.2; Appendix A). This is seen as particularly important in the case of Mathematics, since labelling of children as backward can affect pupils' attitudes to Mathematics and increase "Mathphobia".

3) The new curriculum refers to the use of assessment as a means to provide feedback on the appropriateness of the curriculum (Ministry of Education 1992a; 1992k, para 1).

This implies that the evaluative purpose is being promoted. However, there is no suggestion as to how this could be achieved.

4) Assessment is classified into the "initial" or "diagnostic", the "continuous", and the "final" (Ministry of Education 1992a, 1992k), a category system which depends mainly on when assessment occurs rather on its different purposes.

5) Policy documents make explicit that assessment should be a natural part of teaching (Ministry of Education 1992a, 1992h, 1992k) but do not explain what is actually meant by that. This assumption however seems to be that "planning, implementation and evaluation" are stages of effective teaching, and that assessment occurs mainly at the end stage in the objectives model for curriculum planning (Kelly 1989, pp 48-83), whereas assessment as a natural part of teaching would presumably occur at the implementation stage.

6) The need for assessment of attitudes follows from the three elements of learning specified in the curriculum, viz "knowledge, skills and attitudes" (Ministry of Education 1992a, 1992f). The difficulties of assessment of attitudes are also acknowledged (Ministry of Education 1992a) but there is no practical guidance for teachers.

7) The consideration in the new curriculum (Ministry of Education 1992a para 3.5) of validity in assessment is simplistic. It is assumed that if teachers are aware of the aims of curriculum they will base their assessment on these aims and measure them accurately. In addition, teachers' ability to give clear instructions to children is taken for granted.

8) The difficulties of written assessment in Mathematics concerned with disentangling effects of language used from the effects of mathematical understanding has been seen only in terms of the wording of questions (Ministry of Education 1992a) and not in the sensitivity of assessment to minor changes of language (APU 1980-2; Ridgway 1988).

9) Although a variety of techniques of assessment is illustrated (Ministry of Education 1992a; 1992f. para 4.4; 1992k), written tests are emphasised. This can be seen in terms of the fact that the inter-departmental committee intends to publish a series of written tests as part of BODAPE (Ministry of Education 1992c, p. 3; 1992g) but not anything related to other techniques of assessment. Moreover, a whole section of the new curriculum is focused on the difference between standardised and non-standardised tests. A critical question that ensues is how the tests prepared by the inter-departmental committee will be used.

10) Children's self-assessment is raised by the New Curriculum (Ministry of Education 1992a, para 4.5). However, this issue has not been explored but simply linked to children's social development.

11) Assessment of practical tasks has been considered as important but suggestions as to how this could be done have not been provided. In addition, the difficulties of such assessment have not been acknowledged.

12) Finally, it is suggested that record-keeping should be done in a simple and manageable way so that teachers can draw feed-back from them quickly. Teachers can also take notes derived from their observations on children's attitudes which can have the form of a biographical account

of each child. It is argued that this will help teachers to develop a holistic opinion of each child.

1.3) Critical Analysis of Curriculum Policy in Cyprus

This section draws from the analysis of official documents about curriculum, presented in the previous sections, and identifies 11 problematic areas of curriculum policy in Cyprus. It attempts also to explore the problematic areas of curriculum policy in Cyprus by taking into account the effect of the socio-political cultural and economic factors of Cyprus upon the formation of its curriculum policy.

The first four problematic areas of Cypriot curriculum policy derive from the lack of any rationale about the design of the curriculum in Cypriot policy documents. It has been shown that there is a substantial agreement among the policy documents about the general purpose of primary education - derived from the value assumptions of the Greek Orthodox society of Cyprus - which has a coherent culture. However, Cypriot policy documents do not make explicit the relation of this purpose with the design of the whole curriculum. Thus, the following problematic areas of curriculum policy in primary Mathematics of Cyprus have been identified.

First, policy documents do not provide any suggestion on how the general purpose of the primary curriculum could be achieved (see p. 22). This has implications for policy on Mathematics pedagogy, which has never been justified. A

possible link which could be provided is that between policy on classroom organisation emphasising the importance of collaborative and individual work and the fact that the aspect of the general purpose of education concerned with democratisation (p. 23) implies the need for cooperation (aspect d) and individualisation (aspect a).

Second, issues concerned with the purposes of teaching Mathematics promoted by the new curriculum remain problematic since policy documents do not provide any link between the general purpose of primary education and the purposes of teaching Mathematics. The third issue is concerned with the content of the Mathematics curriculum which remains problematic since it is difficult to know upon what basis some mathematical areas are included, and others are excluded. This problematic area is particularly crucial since current curriculum reform in Mathematics is mainly about a focus on statistics at the expense of "set theory". This shows the need for justifying the perceived importance of Mathematical areas promoted by the new curriculum of 1992 in contrast to those promoted by the 1981 curriculum. The lack of such justification is also in contrast to the fact that cultural factors could be used to provide explanations on the perceived importance of each mathematical area, as it is suggested above (see p. 22).

These three issues remain also problematic since there is no coherent policy about the nature of Mathematics which could become a criterion for the establishment of this rationale. Thus, the lack of any rationale about the design of the

Mathematics curriculum provides Cypriot policy makers with an advantage, since it is possible for the New Curriculum of Cyprus to be manipulated by policy-makers or alternatively to be created or amended in an arbitrary fashion. A rationale for the design of the Cypriot curriculum could be established by taking into account either the general purpose of primary education or cultural factors which influence the formation of policy. This problematic area of Cypriot curriculum policy is also related to the lack of a coherent policy on the nature of Mathematics, which could provide another basis for the establishment of this rationale.

Fourth, it has been shown that there is a discontinuity between consideration of Mathematics as language and the fact that although policy documents support active pedagogy, they do not refer to the need for providing opportunities for children to discuss about Mathematics. This discontinuity has been also identified among policy makers' perceptions (see Appendix A) and can be attributed not only to the fact that there is no rationale for policy formation but also to the model of designing and diffusion of curriculum change, which depends only on inspectors' perceptions. This issue is explored further in the next chapter, which is concerned with the management of curriculum change in Cyprus.

Fifth, it has been shown that there is a mismatch between the consideration of the holistic structure of Mathematics by policy documents and the way which different Mathematical

areas are presented. A question which can be raised is whether the new curriculum, illustrating various Mathematical areas in isolation, can be used for helping pupils to recognise the holistic structure of Mathematics. This difficulty is reinforced by the fact that textbooks, which strongly influence practice, present these topics separately.

Sixth, there is no policy about the use of microcomputers in teaching mathematics. However, policy documents (Ministry of Education 1981; 1990a; and 1992g, p. 1) and inspectors (Appendix A) argue that sources of curriculum change in Mathematics come from changes in the theories of psychology and pedagogy, the different types of personalities which we intend to develop, and the technological and socio-economic changes. Thus, there is an apparent contradiction among policy documents. The lack of a policy on microcomputers is clearly in contrast with inspectors' comments that they intend to develop a curriculum able to prepare children for societal changes (Appendix A) since a lot of primary pupils have started to use computers at home but not at schools.

Seventh, it has been shown that although policy documents did not refer exclusively to the purposes of assessment, the formative purpose rather than the summative is emphasised. However there is doubt about the policy commitment to formative assessment, since the Director of Primary Education announced the government's intention to introduce a reporting system where teachers would be required to

assess pupils' overall achievement in each subject at the end of each academic year (Leontiou 1993).

Eighth, documents dealing with the purposes of assessment have not so far focused on the evaluative purpose. Similar conclusions derived from interviews with inspectors which reveal that they did not have a coherent policy for evaluating the new curriculum in Mathematics (Appendix A). This implies that mechanisms for evaluating the new curriculum have not been established. Implications for the assumptions about the process of change derived from that problematic issue of assessment policy are discussed further in the next chapter.

Ninth, policy initiatives on assessment seem to be closely related to the adoption of objectives model for curriculum planning. This model has implications for at least two issues of assessment policy. First, it has been shown that assessment is classified into "initial" or "diagnostic", "continuous", and "final" and thereby reflects the assumptions of this model. It is however very unlikely that this classification will be helpful for teachers to organise their assessment, since it simply suggests when assessment should occur. It is also possible that teachers will be led to ignore the need for assessment in the implementation stage as has been argued (p. 34, point 5).

Furthermore, Cypriot policy documents made explicit their support about assessment of attitudes and this has been attributed to the dependence of curriculum design in Cyprus

on Bloom's taxonomy of educational objectives (Bloom et al 1956) and related curriculum models (Tyler 1949, and Taba 1962, 1987) rather than on the kind the information gathered from it. It is however important that documents acknowledge the difficulties of assessment of attitudes but do not provide any suggestion on how this could be done. Thus, assessment of attitudes might have relatively weak salience in practice.

Tenth, a doubt about Cypriot policy on the use of variety of assessment techniques can be raised. Inter-departmental committees will publish written tests but no guidelines about oral techniques of assessment or how to assess practical activities. The domination of assessment policy in Cyprus by written tests needs further consideration due to the fact that centralised systems may lead teachers to rely mainly on techniques which are under controlled conditions and can provide information to parents and inspectors. Thus, oral techniques of assessment which are not formally structured (e.g. unstructured observation) are very likely to have a weak salience in practice, not only due to the fact that they can not be easily used but also due to the emphasis which policy makers give to them and the status which they have in a centralised system like that of Cyprus. This problem is explored further in this study since teachers' perceptions about techniques of assessment are examined.

Finally, a problematic area of curriculum policy is the fact that although pupils' self assessment is illustrated as a

possible technique of assessment, documents do not provide any suggestion on how this technique could be used for assessment in Mathematics. This is an issue exclusively related to Cypriot curriculum policy (Blyth 1990a) but needs further exploration, since its use might solve classroom management problems concerned with finding time for adequate observing, assessing and recording. In addition, there is no research evidence on whether pupils are able to assess themselves and this is an aspect which should have been explored before the formation of policy on assessment. This study addresses this issue since teachers' perceptions related to this issue are examined.

2. Curriculum Policy in England

2.1 Evidence about the National Curriculum Policy

This section is an attempt to identify the major issues of curriculum policy and implementation in respect to teaching and assessment in Mathematics as they are reflected in the National Curriculum. The term "curriculum" is used here, as in the Education Reform Act 1988, to incorporate assessment arrangements.

Ball (1990) argues that:

> Policy making in a modern, complex, plural society like Britain is unwieldy and complex. It is often unscientific and irrational, whatever the claims of policy-makers to the contrary. In particular the 1988 Education Act contains a number of 'shots in the dark', policies without pedigree. (p. 3)

This leads me to one of the main conceptual themes running through my attempt to analyse curriculum policy in England, namely the difficulty of defining precisely what policy is. Although the outcomes of curriculum policy in England can be identified in Statutory orders, the fact that since 1978 a plethora of official documents on the primary curriculum was published, implies that such consideration of policy would be too narrow. In supporting this argument, it is worth mentioning that Moore and Ozga (1991) suggest that;

> "We need to take account of a wide range of activity when studying curriculum policy and not simply focus on the provisions of the National Curriculum, or the content of the Action Plan, and the details of assessment procedures. ... All curriculum policies carry within them a view of what should be learnt and thus of the purpose of education...It is perhaps the case that different views about what should be taught underlie the apparently contradictory nature of current curriculum policy" (pp 2-3)

It is, therefore, important to attempt to examine the historical background to current policy, as embodied in the statutory orders, to see the extent to which it is a novel. Although it could be simply suggested that all these documents reflect attempts to create a policy framework in a period when there was not any clearly defined policy (Campbell 1988a), this section will try to trace the development of policy on both Mathematics and assessment and generally on curriculum since 1978.

The analysis of curriculum policy in England will be, therefore, based on a comparison of the issues raised in different official documents published before the ERA and after it. However, these documents need to be classified

into different categories according to the kind of information they provide. Kelly (1989, pp 178-179) classified them into the surveys of the current practices of schools (eg DES 1978), the discussion documents (eg DES 1980a) and those which attempt to set proposals for change (eg DES 1980b). However, the kind of issues raised in most of the documents renders Kelly's classification problematic. The third category is particularly problematic since to some extent all the documents attempt to set proposals for change. Thus, documents are classified here on the basis of their explicit purpose. Classification of these documents following this approach provides the following four categories:

a) Survey Material {eg Primary Survey (DES 1978)},
b) Consultative Reports {eg Cockcroft Report (DES 1982b)},
c) Policy Documents {eg Mathematics in the National Curriculum (DES 1989d)}, and
d) Discussion Documents {eg Mathematics 5-11 (DES 1979)}.

It is necessary to use this classification since a discussion document opens possibilities for people to discuss issues on curriculum policy (e.g. Alexander et al 1992) but it is not of itself official policy. On the other hand, a survey should be judged differently because it produces empirical evidence, distinctively different from evidence in other documents. Thus, the documents in each category are related in different ways to the emerging policy.

Irrespective of the category of documents, the following five issues emerged in all categories and are similar to

those identified in the Cypriot policy documents: 1) The Nature of Mathematics: Implications for Purposes of Teaching Mathematics, 2) Mathematics Pedagogy, 3) Cross-Curricular approach, 4) Curriculum Planning, and 5) Assessment policy. Analysis of the main policy initiatives is presented in the next section, and a critical analysis of curriculum policy is provided in the last section.

2.2 Main Policy Initiatives

A) The Nature of Mathematics: Implications for Purposes of Teaching Mathematics.

This section attempts to show that there is no coherent concept of the nature of Mathematics within the official documents about the curriculum and that this has implications for other policy issues concerned with the design of the curriculum. Analysis of these documents reveals that only some discussion documents (DES 1979, 1985c) and consultative documents (DES 1982b, NCC 1988) dealt with the nature of Mathematics, whereas no policy document focused on it. The Mathematics 5-11 (DES 1979) was the first document which dealt with the nature of Mathematics and illustrated three different aspects of Mathematics: utility, culture and mental training. Each of these aspects was analysed further and aims of Mathematics teaching derived from that analysis. This provided a model for curriculum design based on the nature of Mathematics.

Moreover, the Cockcroft Report drew from Mathematics 5-11 (DES 1979) to provide an analysis of the nature of Mathematics (DES 1982b, p. xi). The usefulness of

Mathematics was seen as arising from the fact that Mathematics provided a means of communication which is "powerful, concise, and unambiguous" (DES 1982b, para 3). It was also suggested that Mathematics should be used "not only to explain the outcome of an event which has already occurred but also to predict the outcome of an event which has yet to take place" (para 4). It was, finally, argued that if Mathematics was seen as a means to develop powers of logical thinking and mental training it would have implications for pedagogy. Although the study of Mathematics could certainly contribute to these ends the extent to which it did so would depend on the way in which Mathematics was taught. It can be therefore argued that the Cockcroft Report implied a relation between perceptions of the nature of Mathematics, the purposes of teaching Mathematics and its pedagogy.

The link between nature of Mathematics and purposes and methods of teaching Mathematics, identified by Cockcroft Report, was expanded by Mathematics 5-16 (DES 1985c). Following the recommendations of the Cockcroft Report, Mathematics 5-16 (DES 1985c) attempted to analyse the aims and objectives for teaching Mathematics, the implications for the choice of content, the approaches to be used and the assessment of pupils' performance. It was argued that all these aspects were interrelated.

However, policy documents and surveys had never dealt with the nature of Mathematics. A survey, due to its purpose, might not be expected to deal with this issue, but the fact

that policy documents do not deal with the nature of Mathematics is of considerable interest. It could be argued that the following four issues raised by policy documents are at least indirectly related to the nature of Mathematics. First, three policy documents (DES 1987a, 1989d, 1991a) supported the need for a broad curriculum, covering different Mathematical areas, though without providing justification of the areas. There were therefore no explanations to show the significance of the several Mathematical topics included in the National Curriculum.

Second, not only policy documents but also documents in the other three categories (DES 1980a, 1980b, 1981, 1982b, 1985c, 1985d, 1987a, 1989d, 1991a) supported the need for a broad, balanced and relevant national curriculum which should be able to serve the individual needs of every pupil and to help them realise their potential to the fullest possible extent. There is however a doubt about whether these documents referred only to the whole curriculum or also to the curriculum of each subject. And even if we assume that they referred also to the curriculum of each subject, documents did not provide any explanation on how the National Curriculum in Mathematics was to be considered a broad curriculum and could serve pupils' individual needs.

The third issue is concerned with Mathematics as a core subject, a status which has never been justified. And although surveys conducted after the introduction of the National Curriculum (DES 1991c, 1992a) showed that Mathematics has always been taught as subject having high

status irrespective of the introduction of the National Curriculum, no policy document made explicit the distinctive status of Mathematics.

Finally, the way which Mathematical topics were presented in the old version of the National Curriculum (DES 1989d) is not the same as the way which they are presented in the new version (DES 1991a). This raises a question related to the structure of Mathematics curriculum. A typical example of this is the fact that SoAs on measurement can be identified in AT 2 (Numbers) and AT 4 (Shapes and Space) of the new version of the National Curriculum, whereas previously there was a specific AT concerned with measurement (DES 1989d, AT 8). All these issues are discussed in the next section concerned with implications of the lack of a policy about the nature of Mathematics.

B) Mathematics Pedagogy

This section attempts to show that there is an explicit pedagogy encouraged by official documents about the curriculum and to identify the extent to which the introduction of the National Curriculum has influenced pedagogical practice. The issues associated with this pedagogy are the following five:

a) Children should have the opportunities to apply Mathematics in everyday life.

b) Children should be engaged in practical and investigative tasks.

c) The role of language in teaching Mathematics is important and thus pupils should be able to talk about

Mathematics and present their results to their classmates.

d) A variety of teaching approaches and a flexible way of working as a class on individual tasks and on collaborative group tasks are suggested.

e) Children should be provided with suitably differentiated activities to enable them to demonstrate fully what they could do

The documents emphasising the importance of each of these issues are presented in Table 2.1 (p. 49a). I will attempt to identify issues of pedagogy supported by the documents of each category (see p. 44 above). First, surveys conducted before the introduction of the National Curriculum (DES 1978, 1982a, 1984a, 1984b, 1985a) showed that children did not have the opportunity to apply mathematical ideas to every day life and there was a concentration of mathematical skills in isolation. This was not seen as either an appropriate or effective method. It was also suggested that appropriate practical and investigative tasks could be used to promote learning. However, it was found out that practical tasks were restricted to the measurement of length and weight (DES 1985a, para 2.30). In addition, only a few schools provided opportunities for children to choose and organise their learning, including the choice of materials. Both the survey of the first schools (DES 1982a) and the middle school survey (DES 1985a) mentioned that games which are popular outside the school and which require children to make predictions and to develop their mathematical skills, were not incorporated in teaching.

Table 2.1: Issues of Mathematics pedagogy raised by English policy documents according to their categories

Kind of documents	Apply Mathematics in everyday life	Practical & Investig/ve tasks	Variety of teaching approaches	Role of language	Matching & Differ/tion
SURVEYS BEFORE E.R.A.	DES(1978,1982a, 1984a, 1984b, and 1985a)	DES (1979,1982a, 1982c,1984b,1985a 1988a, and 1988b)	DES (1978,1982a, 1984a, and 1988a)	DES (1978, 1984a, and 1988a)	DES (1978, 1982a, and 1988a)
SURVEYS AFTER E.R.A.	DES (1989c, 1991c, and 1992a)	DES (1989c,1991a, 1991c and 1992a) SEAC (1991a)	DES (1989c,1991c, and 1992a)	DES (1991c, and 1992a)	DES (1989c 1991c,1992a) SEAC (1991a) NCC (1991c)
DISCUSSION DOCUMENTS	DES (1979, 1980a,1985c, and 1989b)	DES (1979, 1983, 1985b, 1985c and 1989b)	DES (1979,1985b, 1985c, and 1989b)	DES (1979, 1985b, and 1989b)	DES (1980a, 1985b,1985c and 1989b); NCC(1991b)
CONSULTATIVE DOCUMENTS	DES (1982b, 1987c, 1988d) NCC (1988)	DES (1982b,1987a, 1987c, and 1988d) NCC (1988)	DES (1981,1982b, 1987c and 1988d) NCC (1988)	DES (1982b, 1987c and 1988d) NCC (1988)	DES (1981, 1982b,1987b and 1988d) NCC (1988)
POLICY DOCUMENS	DES(1989d ATs 1 and 9); DES(1991a e.g. AT1 strandI)	DES (1991a eg. AT1 strand III AT4 strand I level4); DES (1989d eg AT10 level 4)	Education Reform Act, DES (1989f, 1992c and 1992e)	DES (1991a, AT1 strand II levels 1, 2, and 3)	DES (1989e)

The role of language in teaching Mathematics was identified in three important surveys (DES 1978, 1984a, 1988a). The Primary Survey (DES 1978) indicated that there was not much time for children to discuss their findings and the "Education Observed: A review of the first six months of published reports by HMI" (DES 1984a) pointed out that oral work was neglected particularly with older juniors (para 6). These surveys also argued that a variety of teaching approaches and a flexible way of working as a class in groups or individuals were essential characteristics of effective teaching.

The five aspects of active pedagogy, mentioned above (pp 48-49), were also raised in discussion documents (DES 1979, 1980a, 1983, 1985b, 1985c, 1989a, 1989b; NCC 1991a). However, the document concerned with the teaching and learning of Mathematics (DES 1989b) needs particular consideration, since it offered an exemplification of the "good practice" in Mathematics and drew out the implications for primary schools of the introduction of the National Curriculum. It stressed the importance of practical and investigative tasks as well as the need for a variety of teaching approaches and balance between individual and group tasks and between oral and written tasks.

The consultative documents supported the value of practical tasks since 1937 (Board of Education, 1937) as the Cockcroft report indicated (DES 1982b, para 286). In addition, suggestions related to teaching Mathematics provided in Cockcroft Report emphasised skills, process and method

rather than content, and application and problem-solving rather than abstract knowledge. In this sense, the claim by Ball (1990, p. 136) that the Cockcroft Report articulated the new progressivist discourse, is justified.

The suggestions of the Cockcroft Report are particularly important because changes in the mathematical education climate of the 1980s can be attributed in no small part to its influence (Straker and Thompson 1989). Moreover, many official documents (DES 1985c, 1988d, 1989b; NCC 1988, 1989a, 1991b and 1991e) drew from Cockcroft Report. Finally, the Cockcroft Report's support for active pedagogy influenced the development of government policy as reflected in the guidelines included in the original Working group document (DES 1988d) and repeated in abbreviated form in the NCC revised report (NCC 1988). It would be difficult to provide a better synopsis of the ideas on teaching and learning Mathematics underpinning the Cockcroft report than those in these guidelines (Straker and Thompson 1989). It can be therefore claimed that there has been a coherent approach to Mathematics pedagogy in the discussion and consultative documents, and surveys conducted before the introduction of the National Curriculum.

Although the identification of an explicit pedagogy among the policy documents can not be identified as easily as in other kind of documents, an analysis of the Attainment Targets (ATs) and the Statement of Attainments (SoA) of Mathematics in the National Curriculum (DES 1991a) reveals that teachers can not help children achieve some SoAs (Table

2.1) unless teaching of Mathematics is based on active pedagogy. For instance, SoA of AT1 at level 1 indicates that pupils should be able to use Mathematics as an integral part of practical activities.

Moreover, the revised curriculum was even more explicit about appropriate pedagogy in the way with which the PoS and SoA have been re-defined. The SoAs of the early version of the National Curriculum in Mathematics (DES 1989d) were mainly used to design PoS which have specific context and are explicit (e.g. PoS of AT2 at level 3 refer to the "reading, writing and ordering numbers to at least 1000 and using the knowledge that the position of a digit indicates its value", which is exactly the same as the old SoA of AT2 at level 3). Finally, the fact that the PoS asked, for instance, that pupils should be engaged in activities which involve using materials for a practical task (AT1 Level 1) shows that practical activities for teaching Mathematics are part of the requirements of curriculum policy. It can be therefore argued that the PoS had an implicit pedagogy.

However, there is the problem that in official policy, teachers are free to determine how to organise their own teaching and the approaches to use. For example the National Curriculum 5 - 16: A Consultation document argues that:

> "within the PoS teachers will be free to determine the detail of what should be taught in order to ensure that pupils achieve appropriate levels of attainment. How teaching is organised and the teaching approaches used will be also for schools to determine" (DES 1987, para 27).

This apparent contradiction concerning teachers' autonomy and pedagogy is discussed in the next section.

Nevertheless, the non-statutory guidance in Mathematics (NCC 1989a) drew both directly and indirectly on a number of discussion and consultative documents and argued that active pedagogy is necessary for the implementation of the National Curriculum. Although strictly speaking this document can not be seen as part of curriculum *policy, it is part of* those guidance materials designed to help teachers implement the National Curriculum which has strongly influenced them (DES 1989c, 1990, 1991c, 1991d; NCC 1991c, 1991d). Its suggestions should be therefore taken into account, since they illustrate the particular pedagogy which teachers have to adopt in order to achieve some of the SoA of the Mathematics Curriculum.

Although it is too early to identify the extent to which the introduction of the National Curriculum has influenced the curriculum practice, surveys conducted after the introduction of the National Curriculum (DES 1989c, 1990, 1991b, 1991c, 1991d, 1991e, 1992a, 1992b; NCC 1991c) provided early evidence about the effect of curriculum policy on curriculum practice. These surveys revealed a similar gap between curriculum theory and practice as that identified by the surveys conducted before the introduction of the National Curriculum. Few practical activities were provided for children and teachers were not confident with ATs 1 and 9 (DES 1989a, 1990, 1991c, 1992a). Discussion on Mathematics was still narrowly focused (DES 1989a, 1991c,

1992a), individual work still dominated classrooms (DES 1992a), and teachers simply reacted to those children who asked for help. Doubts about whether National Curriculum had influenced pedagogy were raised in two surveys (DES 1991b, 1992a). These will be explored below (Chapter 3).

Although the use of microcomputers and calculators in Mathematics activities is not explicitly related to Mathematics pedagogy, there is the question of how the use of microcomputers contributes to the objectives of Mathematics curriculum. It can be also argued that the use of microcomputers implies an active teaching method and stimulating environment. However, the only document which deals with the use of microcomputers is the National Curriculum (DES 1991a) which, through the following ATs (SoA of AT 2 at level 4, PoS and SoA of AT 3 at level 6, PoS and SoA of AT 4 at level 6, PoS and SoA of AT5 at level 5) requires that pupils should be able to use them. No other policy document deals with the use of microcomputers for teaching Mathematics. Discussion documents related to the design of curriculum (DES 1980a, 1981, and 1989a) pointed out that curriculum should be relevant to technological changes, but they did not refer to the use of microcomputer. Moreover, discussion and consultative documents focused on initial teacher training and INSET (eg DES 1982c, 1983, 1988a, 1991b, 1992d; and NCC 1991a) did not indicate any implication for ITT and INSET from the fact that teachers must be able to use microcomputers for teaching Mathematics. Finally, discussion and consultative documents explicitly relevant to teaching Mathematics (DES 1982b, 1985c, 1988d,

1989b and NCC 1988, 1991b) had not identified any implication of the use of microcomputers for Mathematics pedagogy.

It can be therefore argued that there has been no coherent policy on the use of microcomputers. This is reflected in the fact that even the Non-Statutory guidance in Mathematics (NCC 1989a) did not refer to their use. Calculators only were mentioned as providing a powerful and versatile tool for pupils to use in learning numbers and doing calculations (NCC 1989a, p. E5). The lack of such policy is reflected in the fact that only one survey among those conducted after the introduction of the National Curriculum attempted to investigate changes in curriculum practice in regard to microcomputers (DES 1992a, para 60).

C) Cross-Curricular Approach

The notion of cross-curricular approach has never been clearly defined by official documents about the curriculum and the term was not used consistently in the documents. It is therefore important to attempt to clarify the meaning of the cross-curricular approach. Three different meanings are provided below.

First, links between subjects can be identified through teaching content. A typical example is the teaching of "symmetry" in both Mathematics and Art. Second, a cross-curricular approach may have to do with the teaching of a general topic such as "Shopping" in which the teacher can integrate Mathematics into a theme with several other subjects. Third, the application of Mathematics in several

subjects can be considered as a cross-curricular approach. This can be linked with the utilitarian nature of Mathematics and the fact that work in other subjects frequently has a mathematical content and contributed to mathematical understanding. This can be seen in the study of maps in geography where the "mathematical" ideas of direction, coordinates, scale and ratio are involved. This classification of cross-curricular approach provides the basis for examining the conceptions of cross-curricular approach supported by official documents about the curriculum.

The Primary Survey (DES 1978) criticised "topic work" as frequently being little more than children reproducing by copying directly material from textbooks. The survey evidence had focused not only on a very limited form of pedagogy but also on a very limited consideration of the cross-curricular approach. However, this survey (DES 1978, para 8.28) indicated that "the basic skills are more successfully learnt when applied to other subjects". It can be therefore claimed that Primary Survey raised doubts about the second concept of a cross-curricular approach above, but accepted the third without however acknowledging any of them as aspects of a cross-curricular approach.

The fact that topic work could provide children with many opportunities for developing mathematical concepts was shown in a survey of first schools (DES 1982a, paras 2.69-2.71). This was linked with the use of play for promoting learning. In addition the need for schools to make links between

Mathematics and other areas was supported (para 2.72). The case of a school where work in science provided opportunities for promoting mathematical contexts, was offered as an exemplar case of good practice (para 2.73). Thus, cross-curricular approaches were treated as aspects of good practice, although there was no consistent treatment of the concept of cross-curricular approaches itself. However, the survey of first schools was influenced by the criticism of topic work in the Primary survey (DES 1978). Despite its findings, it was argued that topic work could not be easily linked in a way that might lead to a growth of skills and understanding.

The middle school survey (DES 1985a) indicated that Mathematics was one of the most commonly areas taught as a separate subject, (para 2.2) and such an approach was not criticised. In addition, teaching of Mathematics through topic work was not supported. On the other hand the first and third dimensions of the cross-curricular approach in Mathematics, presented above, were supported (para 2.34). Again there was no attempt to define a cross-curricular approach in this survey.

Documents dealing with the notion of a common curriculum which had implications for the design of the National Curriculum (DES 1980a, 1980b, 1989a, 1989e, 1989f) suggested the importance of a cross-curricular approach, but argued that teachers are free to decide how to organise their curriculum. For example:

> "It is for individual schools to decide how the curriculum is to be organised for teaching purposes...Topic work for example has potential advantages in facilitating sustained work on themes which children find interesting and relevant;" (DES 1989a, para 16)

It can be therefore claimed that not only lack of a clearly defined notion of a cross-curricular approach, but also a neutral stance about the issue was encouraged by these documents.

Similar conclusions arise from analysing the treatment of cross-curricular approaches from discussion documents (DES 1979, 1985c) and consultative documents (DES 1982b) focused on teaching Mathematics and published in early 1980s. The latter (DES 1982b, paras. 325-329) showed how Mathematics could be linked with other subjects and indicated that this characteristic of Mathematics was related to the perceived nature of Mathematics "as a power to communicate and explain, which can result in Mathematics being used in contexts related to other subjects". Even the Cockcroft Report does not clarify the notion of a cross-curricular approach. Also the discussion documents concerned with teaching Mathematics (DES 1979 and 1985c) did not provide any suggestion about cross-curricular approaches in Mathematics. And although the Mathematics 5-11 (DES 1979, p.8) raised the importance of using Mathematics across the curriculum, it did not explain how this could be achieved.

The following observations arise from analysing policy documents, explicitly related to the introduction of the National Curriculum (eg DES 1987c, 1988d, 1989a, 1989b,

1989e; NCC 1989b). First, the cross-curricular potential of Mathematics has not been effectively elaborated. This can be identified in documents attempting to exemplify good practice for primary schools in the introduction of the National Curriculum (DES 1987c, 1989b). Second, great emphasis on the use of Mathematics across the curriculum has been identified in one document only (DES 1988d). This is illustrated in its argument that:

> "opportunities for using Mathematics across the curriculum should be exploited because as we have argued throughout this report, it is through applying Mathematics in contexts which have relevance and interest that pupils' understanding and appreciation of the subject develop" (para 10.34).

However, Mathematics for ages 5-16 (DES 1988d) did not deal with strategies which would enable teachers to use the third aspect of cross-curricular approach in Mathematics, which seems to be encouraged by this document. The only consultative document which attempted to provide such strategies is the Guidelines 1: A Framework of Primary Curriculum (NCC 1989b) which was published specifically for this reason. It attempted to provide advice on methods and strategies for using cross-curricular approach to the Secretary of State (DES 1989e). The Guidelines 1: A Framework of Primary Curriculum mentioned that "integrated" approach has several meanings (NCC 1989b, para 2.8) but its reference to a primary curriculum described as "thematic", "cross-curricular" or "topic-based" implies that cross-curricular work was seen as identical to topic work and that the other two aspects of cross-curricular approach has not been taken into account.

Finally, the possibilities of linking Mathematics with other subjects provided by the National Curriculum in Mathematics (PoS at Level 5 of AT 2) have not been acknowledged by any other document. Similarly, no document attempted to identify implications of the suggestions in the TGAT report that common PCs across different subjects, should have been produced through a co-operation among working groups.

The lack of any agreed concept of a cross-curricular approach in Mathematics and an attempt to keep a neutral stance about that approach within documents published before the introduction of the National Curriculum in Mathematics (DES 1989d) can also be identified in later documents. This could lead to the misconception of subject-teaching and cross-curricular approaches as mutually exclusive. Alexander et al (1992) argued against the dichotomy between the topic work and subject teaching, and they classified cross-curricular approaches into the divergent topics, broad-based topics and subject-focused topics (para 70).

In addition, surveys conducted after the introduction of the National Curriculum (DES 1991c, 1992a, 1992c) showed that National Curriculum made teachers more aware of the boundaries of the subjects. They have also found out that Mathematics was still taught as a separate subject (DES 1991c, 1992a) and that there was no evidence to suggest that the situation was changing (DES 1992a, para 8). It was also found out that curriculum and assessment planning were complex for those schools which integrated subjects within topics (DES 1992c, para 9). Because all these surveys did

not made explicit what they meant by a cross-curricular approach, a restricted view of a cross-curricular approach was adopted by them.

It can be therefore claimed that a major deficiency in policy documents has been the failure to provide an agreed concept or concepts of a cross-curricular approach. Implications of these weaknesses are discussed in the next section.

D) Curriculum Planning.

Various discussion documents (DES 1980a, 1985b, 1989a; NCC 1991a) and consultative documents (DES 1982b, 1987a, 1987b; NCC 1988, 1991b) considered curriculum planning as very important. It is also widely accepted that planning has been improved (DES 1989a, 1990, 1991b, 1991c, 1991d, 1991e, 1992a, 1992b; NCC 1991c, 1991d; SEAC 1991) in line with the suggestions provided by policy documents. This was attributed to the fact that the ATs and SoAs of the National Curriculum can be used for planning and short-term preparation (DES 1992a, 1992b).

It can be therefore claimed that requirements of policy documents concerned with curriculum planning have been adopted by primary teachers. It is, however, important to take into account a useful distinction between planning and implementation identified by DES (1992a, p. 9) which implies that although planning has been improved, the improvement of standards remains problematic. Only one consultative document (DES 1987a, paras 8, 9, 36) focused its attention

on standards but did not suggest how better planning could raise standards. On the other hand the argument that planning according to age-related ATs might discourage high attaining pupils from achieving standards higher than the relevant requirements of the National Curriculum, (Schwarzenberger 1987) has not been taken into account.

Problems related to planning, which were identified (DES 1989a, 1990, 1991b, 1991c, 1991d, 1991e, NCC 1991d, SEAC 1991), were in terms of some inappropriate progression in numeracy ATs and the lack of a coherence between the SoA and ATs on numbers and algebra. It was also unclear what the difference was between PoS and SoA and what their function was in respect of planning purposes in Mathematics (SEAC 1991). The revision of the orders (DES 1991a) made the distinction between SoA and PoS with the consequence that teachers are supposed to plan according to PoS. Although this could be linked with the fact that teachers wanted the PoS as basis for planning this was done to make assessment manageable and the function of SoA explicitly linked with assessment (NCC 1991d, p.2).

The notion of planning can be linked with the schemes used for teaching Mathematics. Surveys, discussion and consultative documents (DES 1979; 1982a; 1982b, paras 313-314; 1983; 1984b; 1985a; 1985b; 1985c; 1989e; 1989f 1991c; 1992a) suggested the need for having schemes, providing general guidelines related to the school policy on teaching and assessment in Mathematics, based on the requirements of ERA and National Curriculum. However, teachers' heavy

reliance on schemes was criticised as leading to restriction in the range of learning opportunities for pupils (eg DES 1992a) and because they were used in a largely undifferentiated way (DES 1991a). Nevertheless, it was found out that commercial mathematical schemes continued to be the dominant influence on the work done at each key stage and that many schools continued to use them in a narrow way (DES 1991c, 1992a). The main changes made by schools were to the content areas of the Mathematics curriculum covered by their schemes (DES 1992a, para 3). This reveals an effect of National Curriculum upon curriculum planning and particularly upon planning of school policy analysed below (Chapter 3).

E) Assessment Policy.

There was great emphasis in curriculum policy on the establishment of a national assessment system. Policy on National Curriculum Assessment can be mainly identified in the TGAT report (DES 1987c). This was the first systematic attempt to establish the base upon which assessment system in England is being developed. Although the TGAT report was not focused specifically on assessment in Mathematics, an analysis of its recommendations can help to draw out some more specific implications for assessment in Mathematics.

The first issue has to do with the four different purposes of assessment. Documents published in the early 1980s or before, dealt with formative purposes of assessment and teachers' self-assessment (DES 1979, 1982b, 1983, 1985a, 1985b) whereas the consultative documents (DES 1987a, 1987b)

and statutory orders published later (eg DES 1989f, 1991f, 1991g, 1992c, 1992e) focused on both formative and summative purposes. Another aspect of policy about purposes of assessment has to do with the fact that the only document dealing with the evaluative purpose of assessment for national monitoring was the TGAT report. The assessment orders, or any other policy document, have not so far provided suggestions on how this could be achieved.

Second, a variety of assessment techniques was suggested by the TGAT report and other policy documents {Circulars 5/89 (DES 1989f) and 14/91 (DES 1991g) and DES 1991f, 1992c}. However, pilot SATs at Key Stage (K.S.) 3 in 1992 were simply written tests and similar recommendations were made for SATs at K.S. 2. This issue becomes even more important because policy documents (DES 1991g) indicated that SATs should have a strong effect on Teacher Assessment (T.A.).

Third, the TGAT Report conceived of assessment as a natural part of teaching. It is, however, unlikely that such assessment is encouraged by policy documents, emphasising the strong effect of SATs rather than that of TA. In addition, no policy document acknowledged the practical difficulties of implementing such approach to assessment in normal classrooms.

Fourth, TGAT report was strongly against any assessment of attitudes and this focus of assessment is not a part of National Curriculum Assessment. However, the Cockcroft Report, which indicated that the development of positive

attitudes to Mathematics should be a purpose of primary Mathematics, supported assessment of attitudes (DES 1982b, para 423). Although it could be argued that there is a mismatch between these two consultative documents, the fact that documents about the curriculum do not refer to assessment of attitudes, does not mean that they do not consider it as important but simply that it should not be part of a national assessment policy. In this context, it is worth mentioning that assessment of attitudes is part of the records of achievement movement which was encouraged by the DES.

A comparison between surveys conducted before the introduction of the National Curriculum and after it, is provided to see whether there has been any evidence implying possible improvement of assessment in practice, and difficulties in implementing it. Surveys conducted before the ERA (DES 1982a, 1984a, 1985a, 1985b, and 1988b) illustrated a variety of techniques of assessment and emphasised the importance of observation and oral methods. It was however found that teachers' assessment was limited to some written tests on Mathematics which were not particularly helpful for their planning. Surveys conducted after the ERA (DES 1989c, 1990, 1991c, 1991d, 1991e, 1992a, 1992b; SEAC 1991) found that teachers' difficulties with implementation of assessment policy to achieve formative purposes remained unresolved, even during the second year of the implementation (DES 1992a), whereas the uncertainty of the future of SATs encouraged a "wait and see" attitude. This supports the argument (DES 1991c, 1991d, 1992a) that

although schools attempted to develop their own policy on assessment, they did not have a base of good practice to support their efforts. It was also found out that most teachers assessed in isolation (DES 1991d, 1992a; SEAC 1991) and would presumably have limited access to support from colleagues.

As far as the assessment of Mathematics is concerned, teachers found difficulties in how to assess practical and investigative tasks and the evidence showed that the assessment of ATs 1 and 9 (DES 1989d) was neglected (DES 1991c, 1992a). Difficulties were also identified in assessing pupils' oral responses. Moreover, assessment of mathematical attainment was restricted to Mathematics lessons and did not occur in cross-curricular contexts. An issue common to assessment of all subjects has to do with how often a performance had to be seen in pupils' work in order to be accepted as evidence of attainment. This difficulty becomes complicated with the introduction of the new version of the Mathematics Curriculum (DES 1991a) due to the fact that ATs in Mathematics are now fewer and each one is related to a wider range of competences.

It can be therefore argued that although the notion of good practice in assessment was developed (DES 1991c; 1991d, para 5; and 1992a), little progress was made and a series of issues needs to be clarified further (DES 1991c, para 39; 1992a, para 36 and 1991d). These issues are presented in the next section concerned with a critical analysis of the main policy initiatives illustrated here.

2.3) Critical Analysis of Curriculum Policy in England

This section draws from the analysis of official documents about curriculum, presented in the previous section, and identifies problematic areas of curriculum policy. A comparison of the problematic areas of the Cypriot curriculum policy, presented above, with those of the English curriculum policy, is also attempted. Thus, the following 14 issues of curriculum policy are discussed.

First, it has been shown earlier that there is a lack of a rationale about the nature of Mathematics and that official documents do not make explicit the relation of the nature of Mathematics to the design of its curriculum. It is, therefore, difficult to know upon which basis some Mathematical areas have been included in the National Curriculum, whereas others have been excluded. Fowler's (1988) judgement about the consultative report on Mathematics (DES 1988d) was that:

> "It is disappointing to see the demise of the sixth area (discrete or finite Mathematics) ... We are missing a real opportunity for the school curriculum to catch up with recent developments in research and their application in industry" (p. 7).

But this view is difficult to justify in the absence of policy agreement about nature of Mathematics. Moreover, Howson (1991, p.39) found out that "many curricula focus on probability and statistics, but this is often at the expense of many of the "modern maths" topics introduced in the 1960s". This finding shows that although the content of the

English National Curriculum in Mathematics is in line with that of the New Curriculum of Cyprus (p. 37) and those of other national curricula, a problematic critique about its content can be raised. The lack of any rationale about the content of the National Curriculum provides English politicians with a similar advantage to that which Cypriot policy makers have (see p. 35). It is possible for both the New Curriculum of Cyprus and the National Curriculum to be manipulated by policy makers or alternatively to be created in an arbitrary fashion. This raises the question whether the National Curriculum is a broadly defined one, because there is little basis for rational decision making about what should be included and what should be excluded. It should however be mentioned that a rationale for the design of the Cypriot curriculum could be established by taking into account either the general purpose of primary education or cultural factors which influence the formation of curriculum policy. Thus, although this problematic area of English curriculum policy is similar to that identified for the Cypriot curriculum policy, English policy documents could simply base this rationale on a coherent policy about the nature of Mathematics since there is no coherent policy about the general purpose of primary education in England.

The second issue has also to do with the lack of this rational and is concerned with the design of Mathematics curriculum and the purposes of teaching Mathematics, which remain problematic since official documents about the curriculum have never dealt with the nature of Mathematics. More particularly, changes in the structure of the National

Curriculum, exemplified in the change about the place of measurement (see p. 48), can not be justified. This change could be attributed to an attempt to provide specific context to the teaching of measurement which implies that the holistic structure of Mathematics is supported. However, if we assume that we will not be able to explain the fact that AT 1 focuses on the application of skills, knowledge and understanding away from a context. This apparent contradiction seems to be related to the lack of a clear concept about the nature of Mathematics.

Third, an issue related to the nature of Mathematics and its implications for both the design of the curriculum and assessment policy has to do with the fact that the new version of National Curriculum in Mathematics has fewer ATs than the old one, in order to make assessment manageable. However, this approach could be dangerous, since it might tend to over-simplify the complex nature of Mathematics (Fowler 1988).

The fourth issue, arising from the lack of any concept about the nature of Mathematics, relates to policy about curriculum planning. It has been shown that official documents about the planning imply that there is a logically valid pathway through the topics of primary Mathematics. However, Schwarzenberger (1987) argues that it is unrealistic to assume that learning will be acquired in the same order in different pupils. This argument seems to provide some explanation for the fact that surveys revealed that teachers found difficulties with planning based on SoAs

presented in a specific order. Therefore, this debate is related to different considerations of the nature of Mathematics. If you believe that there is a logically valid pathway through Mathematics topics, it means that you also accept that Mathematics is a hierarchical subject and that ability to proceed to new work, is dependent on sufficient understanding of work which has been done before. Alternatively, Schwarzenberger's position would lead to the teacher seeing the hierarchical ordering as inappropriate for planning and assessment. It can be therefore argued that the lack of a clear consideration of the nature of Mathematics has implications for debates concerning not only the design of Mathematics curriculum, but also curriculum planning and assessment policy.

Fifth, although it is explicit that English teachers unlike Cypriots, are free to determine their own policy about teaching methods, the PoS has an implicit pedagogy which is encouraged by the official documents about the curriculum. In supporting this argument, it is worth mentioning that a survey conducted after the introduction of the National Curriculum (DES 1991b, para 46) came very close to accepting it, by indicating that there was a specific pedagogy "which relates to the National Curriculum". This survey did not say what this pedagogy was, but it is very difficult to think how English teachers can achieve some SoA particularly those to do with AT 1, if they do not engage in an active pedagogy.

The sixth issue deals with microcomputers which teachers are required to use (see p. 54). It is, however, unclear what is meant by the good use of computers. The fact that no document illustrates strategies on how teachers can use them, is a problematic aspect of curriculum policy. Thus, although there is a policy about the use of microcomputers in England but not in Cyprus, and every English primary school was given the microcomputers, this does not mean that microcomputers will not stay in the cupboard and that they will not be used in both England and Cyprus.

Seventh, it has been argued that there is an apparent contradiction concerning the fact that National Curriculum made explicit that teachers should be engaged with the third definition of a cross-curricular approach, but no other official document identified implications of this requirement for teaching Mathematics. Furthermore, a neutral stance about cross-curricular approaches emerged from analysis of these documents which at the same time have not clarified the concept of cross-curricular approach.

However, it can be argued that there is a match between the lack of a clear policy on a cross-curricular approach and the subject-based National Curriculum. Nevertheless, teaching Mathematics in the subject-based National Curriculum will remain fragmented and abstract and not related to children's interests and to their activities in other subjects (Furby et al 1992). And even though this approach to teaching Mathematics has been criticised by some documents (DES 1988d, NCC 1989a), the lack of any agreed

stance on the use of a cross-curricular approach will inhibit changes in approach. Evidence shows that teachers (DES 1989c, NCC 1991c), Mathematics Associations (Furby et al 1992), and educationalists (Ward 1990, Ball and Bowe 1992) criticise this aspect of curriculum policy and this is reflected to their comments about the new consultative report in Mathematics, (NCC 1991b) arguing that the proposals made insufficient reference to cross-curricular aspects. A similar criticism for Cypriot policy documents can be made due to the fact that the term cross-curricular approach is misconceived in Cypriot policy documents. However, the criticism of policy about a cross-curricular approach in Cyprus should be linked not only with the subject-based curriculum, but also with the existence of specific timetables for specific subjects.

Eighth, documents dealing with a cross-curricular approach seem to imply that the only alternative solution to topic work for delivering the National Curriculum, is subject-teaching. They have not considered a cross-curricular approach broadly and have not avoided the adoption of a false polarisation of topic work and subject teaching. This assumption is affirmed by surveys conducted after the introduction of the National Curriculum, which showed that National Curriculum made teachers more aware of the boundaries of the subjects. This misconception of a cross-curricular approach provides a barrier to changing practice and is similar to the way Cypriot inspectors perceived a cross-curricular approach (Appendix A).

Ninth, there is a widespread doubt that the summative and formative purposes can be achieved in a single set of assessment arrangements as that outlined by TGAT (Broadfoot 1988, Troman 1989, Noss et al 1989, Brown 1991). Summative purposes concentrate on the overall levels of achievement of pupils, information derived from summative assessment can not easily be used to help teachers with their teaching, but can be used for selection (Broadfoot 1986, p. 59). This conflict is reflected in technical problems which need to be faced (Kimberley et al 1989, p.236; Brown 1991, pp 217-218; Qualter 1988; Murphy 1988).

Tenth, there is also a mismatch between summative purposes of assessment and consideration of assessment as natural part of teaching. Information gathered for summative purposes should be comparable and accurate. However, the more accurately an attainment can be measured, the less likely it is to reflect genuine understanding. Nevertheless, assessment of such attainment will represent a small and unimportant part of Mathematics. On the other hand, an assessment which is a natural part of teaching should attempt to measure the "relational understanding" (Schwarzenberger 1987) which is the most important aspect of teaching Mathematics, but does not give information which can be easily used for summative purposes.

Eleventh, the debate concerned with whether or not a national assessment system can serve both summative and formative purposes, should also take into account the possibility for prematurely labelling children as backward

by either summative or formative purposes of assessment. This is an issue particularly important for Mathematics due to its effect to pupils' attitudes to Mathematics, which are often mainly negative (DES 1982b) but has not been raised by any document dealing with assessment policy.

Twelfth, another problematic area on policy of purposes of assessment has to do with the fact that English policy documents have not so far provided suggestions on how the evaluative purpose will be achieved. Official documents do not provide any rationale upon which further changes of curriculum policy on Mathematics can be justified. This is a common problematic area with that of Cypriot curriculum policy and it has implications for the process of change which are discussed below (Chapter 3).

Thirteenth, the mismatch between TGAT's suggestion that SATs should not be only written tests (DES 1987b, para 47) and the possible development of SATs as mainly written tests, mentioned earlier, is fraught with danger for assessment of primary Mathematics. The Mathematics Feasibility Study at King's College (Schwarzenberger 1987) recommended that there should be no written responses at all for children under 8 years of age. A similar doubt about whether English curriculum policy encouraged the use of other techniques than the written tests has been raised for the Cypriot curriculum policy. However, this issue is particularly important for the English policy, due to the fact that the use of oral techniques of assessment is inevitable for those SoAs, concerned with activities involving pupils' oral

response, (eg SoAs at level 1b and 2b of AT1; at level 1a of AT4 and level 3c of AT5). Nevertheless, the possibility of developing an assessment system based on written tests is encouraged by teachers' difficulties of using oral techniques for assessment in Mathematics and the fact that teachers do not have any experience in using any other technique than written test for assessment in Mathematics (DES 1985a).

Finally, I argued earlier that although assessment of attitudes is not part of the national assessment system, this does not mean that it is not worth doing. However, a critical question concerns the status of activities included in the national assessment system and the possibility that English teachers might undervalue the assessment of attitudes. It can be therefore argued that the fact that Cypriot, in contrast to the English, policy documents made explicit their support about assessment of attitudes is an important difference between English and Cypriot policy on assessment. This is even more important if we take into account the classroom management problems concerned with finding time for adequate observing, assessing and recording (DES 1989c, 1990, 1991d, 1992a, 1992b; Bennett 1989, Silcock 1990, Campbell and Neill 1990 Campbell et al 1991). In this context assessment of attitudes is likely to have relatively weak salience in practice in England. However, the fact that Cypriot policy documents have not supported the importance of assessment of attitudes by taking into account the kind of information that it gives, but have concentrated on its relation to the objectives model raises doubt about the

effect that Cypriot documents will have on teachers' practice.

The next chapter is mainly focused on the effect which curriculum policy may have in practice by examining the management of curriculum change in Cyprus. This examination is partly based on the analysis of curriculum policy provided in this chapter and shows that attempts to evaluate curriculum policy in Cyprus should be focused on an exploration of teachers' perceptions of curriculum policy. In addition, comparison of the conceptual issues concerning the management of curriculum change in Cyprus with those in England is attempted. This comparison helps us to identify possible factors which may influence teachers' perceptions and thereby their effect on Cypriot teachers' perceptions is examined. Finally, comparison between the issues derived from the curriculum policy in Cyprus with those of English curriculum policy, provided in this chapter, helps us to define the issues on which teachers should be asked to express their perceptions, and has implications for the design of the instruments used by this research, as is explained in Chapter 4.

CHAPTER 3: SOME CONCEPTUAL ISSUES OF THE MANAGEMENT OF CHANGE IN CYPRUS: REVIEW OF THE LITERATURE

Howson (1991, p. 5) indicates that curriculum development has not proved easy to effect in many countries and that its success is not dependent on its content only. Five dimensions of the process of change in Cyprus are, therefore, presented in this chapter (Sections 1-5) because policy formation is also about the implementation of curriculum changes. The first is concerned with the process of designing and diffusing curriculum change whereas the other four parts deal with some further issues indirectly related to the process of change. Since the publication of policy documents represents only the first stage of the process of change, further issues of curriculum change are illustrated in this section to help understand the process of change followed in Cyprus. The issues apply equally to curriculum development in other subjects, but the specific implications for the case of Mathematics will be drawn.

Moreover, the analysis of each of these issues is such that a comparison of the strategies which policy makers in Cyprus use to ensure the implementation of curriculum change with those used by English policy makers can be made. This comparison helps us to draw implications for issues of the process of curriculum change which have to be addressed by Cypriot policy makers.

Finally, the last section of this chapter draws from the review of the literature implications for the design of this study which is an attempt to investigate the extent to which

teachers' perceptions of curriculum policy match the policy objectives. This research can be seen as an attempt to evaluate policy on curriculum change in Cyprus and could help to develop a new model of curriculum change for Cyprus, in which teacher development plays a greater role than previously.

1) The process of designing and diffusing curriculum change in Cyprus and the "centre-periphery" model of curriculum change

The process followed for the design and diffusion of any curriculum change in Cyprus can be described as belonging to a "centre-periphery" model (Schon 1971), operating in a highly centralised system. It has been shown that the administration of the educational system is still a centralised one, for political and cultural reasons (Chapter 2), and that the question about who should determine what pupils learn at primary school is not keenly disputed, as it is in Britain (Kirk, 1991). The following two issues reveal that the strategy which is being followed to plan the new curriculum is based on similar assumptions to those of the strategy followed for the planning of the previous curriculum and the introduction of Triminiaia-BODAPE (Three months planning).

First, general principles upon which the process for planning the new curriculum is based have been decided by the Pancyprian Conference of inspectors (Ministry of Education 1992f, para 6.1). Second, a committee consisting of the director of primary education, the general inspector,

the two A-inspectors and a representative of POED (teachers' trade union) provided guidelines to the inter-departmental committees of each subject which designed the curriculum of each subject (paras 6.2-6.5). This committee controls the whole process of designing and introducing the new curriculum. The design of the new curriculum is therefore completely controlled by government inspectors, with the exception of the representative of POED, which has not established any mechanism for consulting teachers. Inspectors are also responsible for evaluating the implementation of the new curriculum and at the same time evaluating teachers.

Implementation of curriculum reform and use of textbooks

Beside the creation of the new curriculum which the centre has sent to schools, documents concerned with how teachers can implement the national curriculum (BODAPE) and new textbooks will be given in 1993 to teachers (Ministry of Education 1992b). Thus, similar approaches to those used for the introduction of the 1981 curriculum are used to ensure the implementation of the 1992 curriculum. The only difference is that for 1992 the function of these three kinds of documents has been made explicit and a link between them has been established. Inspectors saw not only curriculum but also BODAPE and textbooks as part of a model of curriculum development and considered them as equally important (Ministry of Education 1991a). This model contrasts in part with that in England, where ministerial prescription of textbooks is prohibited. However, both textbooks in Cyprus and schemes in England are particularly

influential on curriculum practice and this was acknowledged by policy-makers of both countries (Appendix A; Kyriakides 1992, p. 31). Nevertheless, English inspectors have made explicit their disagreement with undue reliance on textbooks/schemes (see p. 63).

The different consideration of the role of textbooks in Cyprus from that in England reflects the highly centralised system of Cyprus. Although this is in contrast with Cypriot inspectors' training and they can see the negative effect of over-reliance (Theodorou 1978a, Appendix A), the effect of socio-economic and cultural factors (Chapter 2, Section 1.1) seems to be stronger and leads them to produce textbooks. It is assumed that these textbooks will help teachers to implement innovations designed by the centre so that the implementation of curriculum policy can be assured. Thus, textbooks are still used to ensure the implementation of curriculum reform and this reveals a mismatch between the public statements of inspectors who have identified the failure of this model (eg Pantelides 1986, Polydorou 1986) and their decisions at the level of policy implementation.

Rudduck (1991) points out that it is not enough, as we can see in the 1960s in England, to supply teachers with better books and packaged pedagogies. Although good materials and advice do matter, it is the quality of teachers themselves and their generative role in the curriculum change which determines the quality of teaching and therefore the effectiveness of any curriculum change (MacDonald 1991, Holt 1980). It is therefore important to deal with the models of

curriculum change followed in England since the phrase "curriculum change" belongs to a chapter of its post-war history. Lessons from experiences of the various attempts to change curriculum practice in England are drawn below which may help develop a better understanding of the process of curriculum change.

Models of Curriculum Change in England

In 1960s, the early Schools Council curriculum work was based on the assumptions of the centre-periphery model. This model assumes that the innovation has been designed and is ready to be diffused, and that the process of diffusion is centrally managed by the inventors of the innovation. The existence of some central expertise, not necessarily available to the average teacher, is also assumed. This body (centre) attempts to bring about change in a primary school (periphery), concentrating on the content, pedagogy and examinations.

The Council's Annual Report (quoted in Steadman et al 1978, p. 5) revealed how the nature of its task fits closely to this model and asserted that:

> "Its purpose is to undertake in England and Wales research and development work in curricula, teaching methods and examinations in schools, and in other ways, to help teachers decide what to teach and how to teach it.".

One of the aims of the Schools Council, as set out above, was to widen the choice of curricular and teaching methods to teachers. The fact that the central team was able to develop and disseminate ideas to schools implies that its

work should be seen as a typical example of this model. It is, therefore, important to examine its effectiveness.

There have been two general issues relating to the Schools Council's work - the first one is related to the impact and take-up of its work whereas the other deals with its political context. Steadman et al (1978 and 1980) provide evidence about the first issue by investigating the impact and take-up of the School Council's projects in the full range of schools. Teachers in a national sample of schools were asked about the extent to which they were familiar with the projects and the extent to which they made use of their ideas and materials. Despite its limitations, especially the effect of non-respondents on their conclusions, the impact of Schools Council was generally seen as ineffective. The need for the Council to re-assess its ways of communication with schools and teachers was revealed.

It can be claimed that this study showed that if we consider curriculum change as an example of the more general phenomenon of social change, (MacDonald and Walker 1976), then the criticisms of the Schools Council's work include its inadequacy in communicating (diffusion) with teachers and in influencing changes within a school (consequences). Thus, teachers' perceptions need to be considered as key factor in implementation at these two important stages of this model. This is the main explanation for its ineffectiveness, although the School Council's lack of political influence was also a factor, according to Salter and Tapper (1981, p.119) and Nisbet (1973, p.67). Even form

a position of political strength it would have been no easy matter for the Council, or its projects individually, to operationalise a centre-periphery diffusion structure. Similar explanations for centre-periphery ineffectiveness were made in Northern Ireland (Sutherland 1981) and the USA (Campbell 1985).

In the late 1970s, School Based Curriculum Development (SBCD) became one of the major factors in curriculum development in England (Eggleston 1979, p. 77). Campbell (1985) elaborated four features of Eggleston's (1980) analysis of SBCD:

i) It is particularistic : The curriculum development activity is focused upon the diagnosed, or perceived, needs of the specific school or part of it.

ii) It is process-orientated : In terms of strategies for the curriculum intended, the process by which these are developed is important in itself.

iii) It is participatory : The appropriate style for developing the curriculum is co-operative.

iv) It is preliminary : The curriculum development is to be seen as experimental in the sense that it is open to evaluation and appraisal after implementation." (p. 33)

These features stress the role that teachers have to play in the process of this model and the attitudes that are required to underpin it. Skilbeck (1982) provides another important feature of this model when he suggests that, although teachers should be free to define the relevant learning experience, they should also be supported by the system. It is therefore essential, if innovative activities are to take root within the school, for the different 'partners' in the system to accept some degree of teacher

autonomy and responsibility in the change process. It is also a process requiring collaboration by teachers able to interpret general curricular assumptions into a specific curriculum practice.

The critical factors of the effectiveness of this model have been identified by Shipman (1973) who considered that sometimes teachers may be confused about the proposed innovations and their new role. Thus, he attempted to find out how different aspects of school organisation influence the success or failure of the trial of curriculum materials and teaching methods. As a consequence, his project was organised in such a way as to break clear from the traditional centre-periphery model. He took into account the process of the SBCD, since he examined the perceived link of the school-based working team with the development project itself.

Shipman (1973) found out that the net impact of the curriculum project seemed to depend on the commitment of the teachers involved. This reveals that any innovation depends for success on the attitudes of the teachers regardless of its intrinsic merits. Another factor identified by this study was the headteacher. It was argued that heads should support the innovation but not insist on being personally involved (Shipman 1973, p. 53). Finally, Shipman et al (1974, p. 77) claimed that the school climate or ethos is a crucial factor for the effectiveness of this model.

Campbell's (1985) analysis of ten cases of curriculum innovation in primary schools, based on the SBCD model, provides useful empirical evidence. His analysis is mainly concentrated on the role of curriculum postholders and heads in terms of creating a collegial primary school. Campbell re-affirms Shipman's findings about the headteacher's role and provides an emphasis, at the same time on the importance of organisation for this model. He argued that the head had a powerful role to play in creating the kind of climate for the growth of in-school development. However, the role of senior people, such as heads, advisers and others, was conceived of as "servicing, rather than managing, such development in order to ensure authentic devolution and enhanced respect for postholders' expertise" (Campbell 1985, p. 112).

Although during the 1980s teachers began to be under increasing pressure to move outside their classrooms and to become involved in school based curriculum development, educationalists (Campbell 1985, Richards 1986, Tomlinson 1986) advocated collegial ways of working but none of them showed what collaboration looked like in practice. However, Eggleston (1979) argued that the collective and shared nature of SBCD offers motivation to the teachers who participate, and this is one of its benefits. It is therefore important to illustrate the five main criteria which show the existence of a collaborative culture in a school identified by Nias et al (1989). These criteria had implications for the agenda of this research.

First, interaction among teachers was seen as particularly important for the growth of shared meanings among teachers. This finding is in line with Stenhouse's (1975) suggestion that "culture is a process of social interaction ... It is by taking part in a communication system of a group that one learns its culture." (p. 8). Thus, Nias et al (1989, p. 36) draw implications for heads' and deputies' roles in terms of creating opportunities for interaction through talking to colleagues both formally and informally. This aspect of their role was seen as particularly important since it was found out that "regular everyday conversations enabled staff to establish and reaffirm shared meanings in relation to their personal and professional attitudes and beliefs" (Nias et al 1989, p. 94).

It was also argued that staff meetings were important to the development and maintenance of the collaborative culture of the schools Nias and her colleagues observed since these meetings were occasions for interactions. At these meetings individuals should be able to make their contributions to the group irrespective of their formal status and they should expect to receive help and support when they needed it. Moreover, they were the forum in which shared values could translated into action. It is however important to acknowledge the argument of Ginsburg et al (1980, p. 203) indicating that given the demanding work of dealing with large number of non-voluntary pupils, teachers' staffroom conversation, as opposed to staff meetings of a formal kind, which they had observed was dominated by joking rather than professional interaction. Thus, an examination of staff

meetings may help us to investigate whether there is a whole school curriculum policy.

Second, the factors determining patterns of interaction could also encourage the emergence of sub-groups each with their own sub-culture. It was argued that these sub-groups should not place greater value on their sub-group relationships than on their relationships within the wider staff group since such unequal valuing inhibited the development of a single staff culture.

Third, Nias et al (1989, p. 70) point out that "the 'culture of collaboration' contains a potential for professional development". This can be seen in terms of the fact that shared understandings and agreed behaviours enable staff in schools where this culture is dominant to trust and learn from one another. Thus, the development of a collaborative culture is able to support teachers with problems and to contribute to the improvement of curriculum practice.

Fourth, Nias et al (1989) reaffirmed the findings of evaluative studies of school based curriculum development to the effect that there is a close relationship between leadership and the development of school based curriculum policy. They showed that heads should provide their schools with a mission which may help to develop or sustain the school's culture. In addition, heads' personal and professional example was fundamental to the realisation of the mission of their schools. The fact that "persuading" teachers to implement school policies was more difficult

than laying the school's aims down revealed that the development of a school-based curriculum policy depended on head's capacity to influence their staff's practice. It can be therefore claimed that the development of a school-based curriculum can be examined by looking on the various sources of influences over classroom practice and particularly those of head and colleagues. This provides implications for this research (see p. 126).

Finally, although heads' role was particularly crucial, it has been also shown that individual teachers or sub-groups could identify an aspect of the curriculum they wanted to be developed. This implies that SBCD is strongly connected with ideology that the teacher, or at least the whole school with its own sub-groups, should be relatively autonomous and able to investigate and implement a change. MacDonald and Rudduck (1971) support this ideology when they assert that:

> "Teachers tend to be so motivated only if they are involved in what is happening and, indeed, to some extent, in control, if they have been aware of the need for change and recognise what is proposed as meeting that need". (pp 150-151).

There are however three problematic aspects of using SBCD as the model of curriculum change. First, Campbell (1988b) noted the personnel-dependent nature of SBCD, and especially that such change depended heavily for its maintenance on the continued presence in the school of its leader. Since the leader (postholder) had departed, the curriculum initiatives in the one case study school being investigated had faltered.

Second, the crucial factors of school based curriculum development, identified above, revealed that if you could find a school where these factors exist there would be no reason in trying to get it to change. Thus, the implementation of SBCD is particularly difficult and this causes significant problems for any attempt to introduce curriculum change using this model. Skilbeck (1972) noted that any attempt at School based curriculum development:

> "requires a range of skills, strong motivation, postponement of immediate satisfaction, constructive interactions in planning groups and emotional maturity". (Quoted in Eggleston 1980, p.103)

Finally, a problematic aspect of SBCD has to do with the subjectivity in SBCD's evaluation. Hargreaves (1982a) bases his criticism of SBCD on this point and, more precisely, to the fact that relevant literature of this model is based on people who are not disinterested, such as heads or teachers. However, it does not mean that because of this we should not take it seriously into account - only that we should be sceptical about the effectiveness of the change which is reported by participants.

In the late 1980s, politicians seized upon the alleged failure of the educationalists to bring about any change to take control of the process of change (MacDonald 1991). However, the National Curriculum of England and Wales does not specify particular curriculum organisation or a curriculum in action, as is the case with the New Curriculum of Cyprus; rather it is the framework within which all the

schools must create their own curriculum policy and their plans for each subject, (DES 1987a, para 26). These matters, which need to be addressed by schools, can be identified in the Non-Statutory Guidance of Mathematics (NCC 1989a, B3). They are the need for specification of the amount of time to be spent on Mathematics, for organisational arrangements, for decisions about the particular books and materials to be used and the specification of the practical details of mathematical topics or activities, and in the sequence in which they should be taught. Thus, the National Curriculum should be considered as a centrally devised set of curricular objectives, based on the assumption that the school is going to adjust them to its own climate and to deliver it. Consequently, the introduction of the National Curriculum suggests that the previous polarisation between centre-periphery and School Based Curriculum Development was mistaken since the National Curriculum requires both models of development.

Moreover, a move from package development to teacher development and finally school development can be identified in England. Analysis of the English policy documents reveals that the requirements of the ERA make the development of school policy necessary due to the difficulties experienced by primary teachers in teaching the National Curriculum. This can be seen in terms of the following two aspects of school policy. First, team planning and working is considered as a solution for teachers to implement the National Curriculum since it requires a range of skills and knowledge which individual

teachers may not have (DES 1991a, 1992a). This has important implications for primary Mathematics since teachers' subject-knowledge is of fundamental importance (DES 1982b, Fowler 1990). Therefore, the need for a school policy has not been removed and a coherent school policy decided by the whole staff to enable the implementation of the National Curriculum was encouraged. This is a significant difference between the English and Cypriot model of curriculum change since there is no school based curriculum development in Cyprus.

The function of the school policy in England is however focused on the use of non-statutory orders for the development of specific guidelines (NCC 1991c) and the revision of the schemes to match with ATs (DES 1989a, 1990a, 1991b, 1991c, 1992a, and 1992b). In addition, surveys conducted before the introduction of National Curriculum and after showed that similar problems have to be faced in developing school policy (e.g. lack of non-contact time). For instance, school-based INSET which aims to support teachers with the implementation of National Curriculum and its assessment (DES 1991b, 1991d, 1992b), can not be easily provided in the teaching day.

Second, the need for having a curriculum co-ordinator can be also identified in the difficulties teachers have had in implementing the National Curriculum in Mathematics due to either lack of subject-knowledge or relevant training. This issue is also related to the fact that the introduction of the National Curriculum encouraged the development of a

school policy. However, this can not be seen as an issue attributed entirely to the requirements of ERA, since this need had been identified by the Cockcroft Report (DES 1982b, paras. 354-358). Nevertheless, the emphasis of surveys after the ERA on the issue and their attempt to identify the effect of co-ordinators in supporting teachers to teach into National Curriculum (DES 1991b, 1991c, 1992a) as well as recommendations of the Secretary of State (DES 1992f) imply that its role has been seen as important for the implementation of the National Curriculum. Although Cypriot teachers have to face similar difficulties in implementing the New Curriculum as those of English teachers particularly due to lack of subject-knowledge, there is no policy about the role of curriculum co-ordinators in supporting colleagues with the implementation of the New Curriculum in Cyprus. On the other hand, English policy documents explored further this possibility. Taking into account the fact that the extent to which co-ordinators can affect practice has not changed, a discussion document (Alexander et al 1992) has examined that need in terms of issues of curriculum organisation like that of the role of class-teacher and cross-curricular approaches. There are however limits to the effectiveness of this policy nationally since there are shortages of teachers well-qualified in Mathematics (Fowler 1990, p. 58).

Nevertheless, a question arising from the analysis of post-war policy for curriculum change in England is whether Cypriot policy-makers should draw lessons from the experience of curriculum change followed in England and

realise the limitations on those outside the schools (eg interdepartmental committees) to improve the quality of the provision within them by supplying teachers with packaged pedagogies and books.

2) Teacher Development

The difficulties of the "centre-periphery" model of curriculum change has also to do with the fact that the quality of teachers determines to some extent the implementation of curriculum policy. A major impact on the process of change followed in England in 1970s. In-service education in 1970s became a source of curriculum change and the concept of the new kind of teacher, the ""professional", who was able to determine his/her own curriculum was developed. The "teacher as researcher" and "action research" (Stenhouse 1975, Halsey 1972) were the prominent ideas which called for teachers able to engage with curriculum research, development and evaluation activities. The need for a strong link between curriculum reform and teacher development is also reflected in theories of curriculum change (Fullan 1991, Fullan and Hargreaves 1992a). This raises questions on links between the reform of teacher's professional development and curriculum reform in Cyprus. This section is divided into two parts. The first one examines such links in Cyprus and the second attempts to draw lessons from the attempts of English policy makers to use teachers' professional development as a way to ensure the implementation of curriculum reform.

2.1) Curriculum reform and teacher development in Cyprus.

This section argues that there is no link between curriculum reform and teacher development in Cyprus and attributes that to the process of curriculum change followed in Cyprus which implies a limited role for teachers.

A) Initial Teacher's Training (ITT)

Cypriot student teachers are nowadays required to attend courses equivalent to a four year bachelor degree in education rather than three years of a teachers' training college and the programme of their studies (University of Cyprus 1992) is mainly based on the programme of Pedagogical Academy of Cyprus (PAC 1985). However, teachers' status has become higher since they will be holders of a University degree. Nevertheless, the fact that neither PAC nor the department of education at the University of Cyprus has any course related to curriculum development suggests that they do not consider it appropriate for teachers to study curriculum development. Thus, teachers' role in the process of curriculum change is restricted to adopting materials published by the centre into their teaching practice. This perception is reflected in the only one optional course of the University related to curriculum theory ("Teaching programmes and Textbooks", EPA 403) which assumes a very restricted role for teachers focused on their ability to adopt the curriculum (implying the national curriculum) to his/her children's needs (University of Cyprus 1992, p. 30).

There is also a conflict between the emphasis given by the Ministry of Education on assessment policy (p. 33) and the fact that the university offers only an optional course on assessment (University of Cyprus 1992, p. 10 EPA 304). It can be therefore claimed that although tutors of both PAC and University have representatives in the committees responsible for the design of the curriculum (Ministry of Education 1992b), there is nothing to suggest that the programmes of ITT have been adjusted in the light of current curriculum reform.

B) In-Service Training (INSET)

Analysing the provision of INSET, similar conclusions can be drawn. The INSET of primary and secondary school teachers is the task of the Pedagogical Institute (PI). There is no school-based in-service training in Cyprus. Although it was argued that "school-based in-service training will be widely used during the above five-year period (1990-95)" (Ministry of Education 1990a, para 1.4.9.2), there is nothing to suggest that centre is going to bring about any change in the kind of INSET provided in Cyprus.

Optional Courses Offered by Pedagogical Institute (PI)

Optional courses provided by PI are the main kind of INSET offered to Cypriot teachers. Apart from the negative effect on teachers' professional development by the lack of other kinds of INSET (Bell 1991), the fact that INSET in Cyprus is mainly based on optional seminars which are held in the afternoon means that most teachers can not attend them easily. However, these seminars are supposed to be related

to both the content and the teaching of the various curriculum areas as well as to recent trends in education.

Nevertheless, only two of the courses provided by PI during the last five years (Pedagogical Institute 1988, 1989, 1990, 1991, 1992a) are related to curriculum reform in Mathematics. First, a course on problem-solving provided in 1991-92 and 1992-93 (Pedagogical Institute 1991, 1992a) focused on issues similar to those provided by the new curriculum reveals an attempt to link curriculum reform with INSET in terms of the following three aspects: a) the content of the new curriculum is substantially different from the previous one in terms of problem-solving; b) the inclusion of a theoretical analysis of strategies of problem-solving in the published materials offered to teachers in this course (Pedagogical Institute 1991) is similar to the analysis of the New Curriculum; and c) these materials link theory with practice and illustrate them with several examples. The content of these materials is similar to schemes used in England and examples provided there seem to be drawn from English, rather than Cypriot, daily life. This reveals the effect of English system upon Cypriot curriculum policy and INSET, which has been discussed in Chapter 2.

Second, links between curriculum reform and an optional course on assessment in Mathematics (Pedagogical Institute 1991, Course D2201) can be seen in terms of the following three aspects: a) the guidelines offered in this course focused not only on the theory (Pantelides 1991a,pp 1-2) but

mainly on practice (pp 3-8); b) the course was mainly focused on the problematic notion of diagnosis which can be seen as a reflection of the emphasis of policy documents on this notion; and c) the suggestions provided had mainly to do with written tests and this can be linked to the emphasis on written tests by policy documents (p. 33). Although a link between curriculum policy and the two courses described above can be identified, the fact that such a link can be identified in only two of the INSET courses offered by the centre raises doubts about whether INSET is seen as a way to ensure the implementation of curriculum reform.

Compulsory INSET Courses Offered by PI ("Epimorfose")

This argument is supported further by analysing the compulsory INSET courses offered to teachers since 1988. Teachers are required to attend a series of seminars ("Epimorfose") which will enable them to be treated by the government similarly to the teachers who will be graduates of the University of Cyprus. Although this has mainly to do with increasing their salary and through that their "status", these courses could contribute to teachers' professional development. It is, however, difficult to identify any course which raises either theoretical issues or practical suggestions related to curriculum reform in Mathematics.

First, courses offered by "Epimorfose" do not raise any pedagogical issue substantially different from those raised by the courses offered by their ITT. A typical example is the compulsory course on assessment dealing with similar

issues to those raised by a course of PAC ("Educational Evaluation") which was focused on written tests and had no effect on students' confidence in assessment in Mathematics (Kyriakides 1992). The emphasis of the INSET course on written tests is reflected in the assignments which teachers have to produce and which are mainly focused on constructing written tests (Pedagogical Institute 1992b, pp 5-6). It is therefore very doubtful whether this course will be able to increase either teachers' interest or teachers' confidence in assessment.

Second, a comparison of the programmes of study of PAC (PAC 1985) and the courses of "Epimorfose", (Ministry of Education 1991e) suggests that only two courses have not been provided by the former. The first one has to do with the history of education of Cyprus during the British rule and the other has to do with the methods of educational research. It is particularly difficult to see how the former can be linked to curriculum theory. And although the latter could have implications for both curriculum theory and practice, it has not been focused either on the notion of action research (Elliot 1981, p. 1 and 1991, p. 49) or on the role of research for curriculum development in Cyprus.

Third, teachers have also to select a course about one subject from a list of ten subjects which are taught in primary school. It is indicated that purposes, aims and teaching methods of that primary subject will be illustrated as well as innovations related to that subject (Ministry of Education 1991e, p. 2). Mathematics is one of these subjects

and the course outline (Pedagogical Institute 1992c) reveals an emphasis on topics which have been also emphasised by the curriculum of 1992 (eg Statistics, Estimation). In addition, the emphasis of this course on geometry can be linked to the cultural context of the educational system of Cyprus mentioned above (p. 15). However, this course comprises only 20% of the teaching periods of "Epimorfose". It can be claimed that this represents the low importance which course planners of "Epimorfose" attached to courses on curriculum practice.

This training in specific subjects raises the questions whether officials of the Ministry of Education will link that training to the idea of having co-ordinators. The issue of the curriculum co-ordinator has never been discussed in any policy document. This could be attributed to the fact that school based curriculum development is an idea which can be identified and supported warmly in conferences (eg Theofilides 1993) but not in practice or in any policy document. However, officials of the Ministry of Education have an opportunity to show practically their interest in this kind of INSET which can contribute to the establishment of a less centralised system rather than indicating rhetorically that "teachers are encouraged to modify and adjust the curriculum, according to their environment and the particular needs on children" (Ministry of Education 1990a, p. 22) whereas in practice teachers are encouraged to teach from textbooks.

2.2) Lessons drawn from English curriculum policy

Although there is no link between teacher training (either initial or INSET) and curriculum policy in Cyprus, such a link could be identified in England even before the introduction of the National Curriculum in terms of the following two aspects. First, surveys conducted before the ERA (DES 1978, 1982a, 1984b, 1988b) were concerned with the need for INSET to provide teachers with experiences from a wide range of teaching methods taking at the same time into account aspects of good practice. A typical example of this is the suggestion that unless tutors adopt a team teaching approach to link work in educational studies with topics concerned with more than one subject then student teachers will not be able to develop cross-curricular approaches into their teaching practice (DES 1988b, pp 11 and 37). Second, discussion and consultative documents of the early 1980s suggested that INSET should take into account technological changes and the expectations of society from education as well as problems which new teachers have to face in order to contribute to the effort for improvement of curriculum practice (DES 1979, 1982b, 1983, 1985a).

However, teachers' development in England is nowadays perceived in an even more specific way. A particular concern is how teachers would become able to implement the requirements of ERA (Taylor 1990). This can be identified in surveys and discussion and consultative documents published after the ERA in terms of the following six aspects. First, its relation with the effectiveness of reform and especially

with the assessment where teachers' experience was very restricted can be identified (especially DES 1988c). Second, working groups (e.g. NCC 1988) called for INSET to familiarise teachers with the PoS, ATs and SoA. Such suggestions can be also identified in policy documents (DES 1989f, 1992d) which indicated the need for redirecting the INSET in the light of National Curriculum and for an adoption of them into longer-term strategies to help the development of school policy.

Third, emphasis was given to the need for ITT to prepare student teachers to teach National Curriculum and for INSET to equip them with the range of subject knowledge (NCC 1991a). It raises, however, practical problems for teacher training since the extent of subject knowledge required to teach the National Curriculum is more than can reasonably be expected to be provided by either ITT or INSET because the task of primary teacher has changed dramatically.

Fourth, surveys conducted after the introduction of National Curriculum revealed that INSET has been influenced by the introduction of the National Curriculum and its assessment. This can be identified in terms of DES financial allocation in 1989/90 and 1990/91 which showed that provision for training for the National Curriculum content was increased from £41 million to £48.8 million. Fifth, surveys concentrated on INSET (e.g. DES 1991c) revealed a focus of INSET on how to make teachers more confident on teaching in the National Curriculum. This kind of INSET was seen as

successful since teachers' awareness on issues of curriculum policy was improved (DES 1991c, 1991d, 1992a).

However its influence was dependent on those responsible for its delivery, and especially on their attitudes to the National Curriculum since a correlation between trainers' and trainees' perceptions was identified (SEAC 1991, DES 1991b). This can be linked with the opinion (DES 1979) that INSET should attempt to persuade teachers to use the mathematics pedagogy and work to achieve the aims as they are presented by them. This suggestion reveals both the significance of teachers' perceptions for the effectiveness of any curriculum change and that of the INSET tutors' perceptions for the former, which are analysed further in the next section.

Sixth, the need to provide teachers with wide range of subject-knowledge in order to enable teachers to provide a broad curriculum (DES 1991b, 1991c, NCC 1991c) was an issue strongly emphasised by surveys conducted after the introduction of National Curriculum. This need can be attributed to the difficulties which teachers have to face with the implementation of National Curriculum. This suggestion is also supported by the argument (DES 1991b, 1992a) that National Curriculum in Mathematics should not be tackled until primary teachers' knowledge on certain aspects of Mathematics had been strengthened. However these areas have not been defined. Nevertheless, teachers' initial training and later professional development are closely

related to the management of the current curriculum reform in England.

It can be therefore argued that Cypriot policy makers should explore the possibilities of developing a link between policy on teachers' professional development and the current curriculum change along the above six dimensions for which such link is promoted by the English curriculum policy. A particular concern should be on how Cypriot teachers would become able to implement the requirements of the New Curriculum by providing them with subject-knowledge, suggestions concerning implications of curriculum policy for curriculum practice, and helping teachers to feel confident in teaching in the New Curriculum.

3) Exploring teachers' perceptions

Teachers' role in the process of curriculum change can be seen not only in terms of their abilities to implement curriculum policy but also in terms of the importance of their perceptions of curriculum reform for its implementation. This is an issue derived from theories of curriculum change which revealed that the exploration of teachers' perceptions should be considered as a main aspect of any attempt to evaluate curriculum change. This issue is clarified in this section by drawing from theories about the process of curriculum change (Section 3.1), studies concerned with teachers' status and professionalism (Section 3.2), and research into teachers' thinking (Section 3.3) the importance of teachers' perceptions for the process of

curriculum change. The last part of this section (3.4) reveals that both Cypriot and English policy makers did not attempt to explore teachers' perceptions of curriculum policy and this provides the basis for a significant criticism of their attempts to manage curriculum change. It also provides implications for the framework of this research discussed in the last section of this chapter.

3.1) Teachers' perceptions and models of curriculum change.

Fullan (1991, p. 94) argues that the reasons for the failure of most educational reforms goes far beyond the identification of specific technical problems. He supports Wise's (1977 and 1979) argument that policy-makers are frequently "hyper-rational" and points out that:

> "innovators need to be open to the realities of others: sometimes because the ideas of others will lead to alterations for the better in the direction of change, and sometimes because the others' realities will expose the problems of implementation that must be addressed and at the very least will indicate where one should start" (p. 96).

Thus, the need for exploring teachers' perceptions of curriculum policy is important since research into these perceptions might contribute to teachers' meaningful involvement in the formation and evaluation of curriculum policy. The need for such involvement is supported by an attempt to evaluate the various models of curriculum change used in England and Cyprus provided above (pp 81-91). The failure of centre-periphery model in England (Steadman et al 1978 and 1980, Nisbet 1973) and Cyprus (Kyriakides 1992) has

been attributed to the fact that teachers' perceptions were inadequately considered at two important stages; the adoption, ie the teachers' decision to use an innovation, and the implementation, ie its realisation. As far as School Based Curriculum Development (SBCD) (Skilbeck 1984) is concerned, Shipman's (1973, p. 53) conclusion about the critical factors in its effectiveness included teachers' perceptions. Even the role of head is considered in terms of a school ethos which promotes teachers' involvement. Similar findings were derived from other studies focused on the implementation of SBCD (eg Campbell 1985 and 1988b, Eggleston 1979) as has been mentioned above. Finally teachers' perceptions are the most crucial factor in "networking" (Hoyle 1973, House 1974) since this model concentrates more on teachers' development than materials. The need for teachers' involvement in the process of curriculum change was also derived from studies concerned with the process of curriculum change in other Commonwealth countries (Bacchus et al 1991).

The exploration of teachers' perceptions does not have implications only for the models of curriculum change defined by Schon (1971) and Havelock (1971) but also for models concerned with the dissemination of curriculum change. Rudduck and Kelly (1976) isolate the following four components in the dissemination process. First, "translocation" concerned with movements of people and materials necessary for the implementation of curriculum change. "Communication" is the second component which describes how information about an innovation is transmitted

from one person to another. Third, "animation" is the component which describes the need to arouse teachers' interest in the project and to provide some motivation for them to involve themselves in it. Finally, "re-education" is the component that implies that considerable understanding and commitment are required in the effective implementation of an innovation. It can be therefore argued that exploration of teachers' perceptions has implications for these points since it can illustrate sources or barriers for either communication or re-education. On the other hand, exploration of teachers' perceptions supports the animation component since teachers' interest on curriculum reform can be identified.

Kelly's (1989, pp 114-143) analysis of the strategies for curriculum change and development followed in England provided similar conclusions. He suggested that teachers' role was crucial not only in the implementation of curriculum reform but also in its evaluation. Similar findings derived from studies of curriculum development beyond England and Cyprus like the Rand study which attempted to identify what tends to promote various kinds of changes in the schools and what does not. In particular it attempted to identify:

> "for federal, state and local policy-makers the nature, permanence, and extent of dissemination of innovations that are associated with the various federal programs and with various federal, state, and local practices" (Berman and Mclaughlin 1975, p.iii).

The notion of "mutual adaptation" derived from that study as crucial for curriculum change reinforces the argument that teachers' perceptions of curriculum policy must be explored.

3.2 Implications of an exploration of teachers' perceptions for teachers' role and professionalism.

The need for exploring teachers' perceptions can not be identified only in studies focused on the process of change but also in studies focused on teachers' role and job satisfaction and particularly in terms of the notion of "psychic rewards" identified by Lortie (1975). This notion has been linked with the notion of change by Rosenholtz (1989a, p. 423) who indicates that:

> "Of the many resources required by schools, the most vital are the contributions-of effort, commitment and involvement-from teachers ... Central to a school's academic success, then, is its ability to motivate teachers to make meaningful contributions to it" (p. 421).

This requirement for teachers' productive commitment to schools is not only able to provide that "psychic reward" to teachers but is also crucial for school effectiveness. Teachers' role in the process of curriculum change is analysed further by Fullan (1991, pp 117-143). It can be, therefore, argued that both formation and implementation of curriculum policy should be based at teachers' meaningful involvement in it.

Teachers' meaningful involvement in the process of curriculum change may have implications for the political ideology in the structure of the educational system.

Skilbeck (1990) suggests that a sharp and uncompromising distinction between centralised and decentralised systems is clearly inadequate in the situations most of the countries are now addressing. He indicates that it presupposes a simple dichotomy which does not represent the reality of various educational system. He also supports the need for sharing roles and responsibilities. Thus, exploration of teachers' perceptions of curriculum policy may contribute to the development of a system based on sharing roles and responsibilities for the process of curriculum change. This exploration may also have significant implications for teachers' role and professionalism. This argument is explored further in the last chapter of this research (Chapter 7) taking into account its findings.

3.3) Research into teachers thinking

The importance of teachers' perceptions is also supported by research on teachers' thinking (Yaxley 1991, Zeichner et al 1987, Berliner 1987, Clark and Yinker 1987, Carter and Doyle 1987, Olson and Eaton 1987). Although such research does not provide us with a comprehensive and theoretical framework for thinking about teaching, it does provide us with an insight into the process of curriculum change. Calderhead (1987) points out that research into teachers' thinking shows:

> "how unrealistic it is to conceive of innovation as a set of pre-formulated ideas or principles to be implemented by teachers. Innovative ideas are interpreted and reinterpreted by teachers over a period of time and translated into practice in a process that involves teachers drawing upon several different

knowledge bases and interpreting and manipulating various interests" (p. 17).

It can be therefore claimed that policy on curriculum change should treat teachers as "reflective practitioners" (Schon 1983). Research on teachers' thinking reveals that teachers possess a body of specialised knowledge acquired through training and experience related to teaching methods, subject matter and child behaviour together with other information resulting from their experience of working with children in numerous contexts (Calderhead 1987, p. 1). Thus, not only teachers' perceptions should be examined but also factors which influence them. This suggestion has implications for the research agenda provided in the last section of this chapter.

In addition, Doyle (1986) argues that teachers deal with complex and ambiguous problems and have to make professional judgements and decisions. This suggests that policy-makers should find out ways to enable teachers to disclose their "knowledge in action" (Schon 1983) verbally which can contribute to the development of curriculum policy. This argument implies that it is important to deal with attempts of Cypriot policy makers to explore teachers' perceptions at the stage of both formation and evaluation of current curriculum reform.

3.4) Exploration of teachers' perceptions of curriculum policy by policy- makers

Cypriot policy makers have claimed that they are interested in teachers' professional involvement in the revision and

updating of curriculum policy (Sophianos 1978; Ministry of Education 1990b; and 1992c, p. 5). However, their interest in teachers' perceptions can be examined only in the case of "Triminiaia" (Three Months Teachers' Planning). It is important to examine this case since "Triminiaia" is an essential part of current curriculum reform. Before the academic year 1990-91 teachers had no guidelines on how to plan their teaching activities. They were however responsible for producing their own three months plan and submitting them to their heads. Inter-departmental committees produced "Triminiaia" (Ministry of Education 1990b) which teachers could use voluntarily, on an experimental basis. There was one for each subject and they deliberately did not have the same structure. At the end of the academic year schools were asked to send comments derived from the experiences of using them. These comments were analysed by inspectors and general conclusions were provided to schools as feedback.

The analysis of these comments was not an easy task since teachers had been asked to comment in an open-ended, unstructured form. Moreover, the analysis of the comments on Mathematics which was sent to the schools shows the difference of "Triminiaia" (Ministry of Education 1991f, paras 3.3-3.5) from the curriculum of that period, the purpose of the introduction of "Triminiaia" (para 3.1), and the theory upon which they have been based. Thus, these comments have nothing to do with teachers' experiences from using them and hence there is a conflict between what inspectors have asked teachers to do and what the report

presenting teachers' comments (Ministry of Education 1991f) is about. This conflict may have to do either with teachers' misconception of what they were supposed to do or with problems of analysing these comments which led inspectors to change their decision. It can be however argued that teachers' perceptions have not been taken into account since "Triminiaia" were used in the next academic year (1991-92) without any change. In addition, "Triminiaia" were adopted into the new curriculum with a new name (BODAPE) but without changing at all and this raises further doubts on whether inspectors were really interested in teachers' perceptions and whether they have taken into account teachers' comments.

If we compare attempts of English policy makers to explore teachers' perceptions with those of Cypriot inspectors we will find out that teachers' perceptions have not been taken into account by either Cypriot or English policy makers. And even if the interest in teachers' perceptions of English policy makers can be identified in the Secretary of State's requirement to NCC and SEAC to forge close links with teachers to ensure their professional involvement in the revision and updating of the National Curriculum (DES 1989e, para 5.2), there are only two policy documents (DES 1992c and 1992e) indicating this interest. They provided a questionnaire and invited responses to the issues raised by the order. Methodological problems with the interpretation of the findings can be easily identified and especially in terms of the content of questionnaire since a large number of policy issues were taken for granted. This process has been also used in discussion and consultative documents

(e.g. DES 1985c, 1987b, 1988c, 1989a). The methodological problems in analysing English teachers' comments are the same as those of analysing the Cypriot teachers' comments.

However, recent surveys in England indicated the importance of teachers' perceptions (eg DES 1991b, 1992a). This is illustrated in the argument that approaches to teaching Mathematics are not likely to change "unless either, perceptions change towards the value of cross-curricular approaches for learning mathematics, or external pressures cause it to happen" (DES 1992a, para 18). In addition, a survey on the implementation of the National Curriculum in Mathematics (DES 1992a, para 60) indicated that the problem in the implementation of the National Curriculum in terms of teaching mathematics for ATs 1 and 9 (DES 1989d) should be attributed to the fact that Mathematics is perceived as a non-practical subject. This suggests that teachers' perceptions have not been taken into account. Moreover, it argues that if implications of ATs 1 and 9 are fully acknowledged then this perception should change. This implies both that teachers' perceptions are significant for the implementation of National Curriculum and that the latter can influence the former, a form of mutual adaptation.

Thus, analysis of theories of curriculum change from three different perspectives (Sections 3.1, 3.2 and 3.3) and early findings from the implementation of current curriculum reform in England reveal that teachers' perceptions of curriculum policy needed to be taken into account in both

England and Cyprus. And even if both English and Cypriot policy makers acknowledged it, they did not systematically manage to collect evidence about teachers' perceptions which could have implications for the evaluation of curriculum policy. This argument provides significant implications for the agenda of this research.

4) Contractual and Professional Accountability

It can be argued that when a government brings in curriculum reform it can call upon two different kinds of accountability. It can call upon the obligations that teachers have to their employers who lay down certain things that they have to do (Contractual accountability). Thus, policy documents can be seen as a kind of contract which teachers have been accepted when they become employed. The state can also call upon teachers' professional accountability to bring in reform. This implies that teachers should be involved in the process of curriculum change and therefore their professional values and ideology are taken into account. In that case policy-makers have to ensure that reforms are compatible with, or take account of, teachers' perceptions. These two kinds of accountability may be frequently in conflict. Thus, the dilemma involved in an exclusive focus on either of them is a conceptual issue of the management of change in Cyprus, analysed below.

Officials of the Ministry of Education take for granted that there is a professional commitment to the development of curriculum policy in Cyprus. However, analysis of the

process of curriculum change in Cyprus (Section 1) raises doubts about the teachers' commitment except that POED has one representative in the committee responsible for developing curriculum policy, which could be seen as a limited form of professional accountability. Nevertheless, POED's representative is not aware of teachers' perceptions since POED has not established any mechanism to identify teachers' perceptions. Finally, POED's contribution to the development of the new curriculum can be identified only in terms of one document indicating that POED had expressed worries on publishing reports of assessment for children of year 5 and 6 (Ministry of Education 1992k).

The fact that POED's function on curriculum matters has never been made explicit can not be identified only in terms of its direct contribution to committee's for developing curriculum policy. My analysis of the articles presented in its monthly paper, Ekpaideutikos (The educationalist), since 1970 identifies less than 8% of them concerned with general educational issues. POED's official opinion on issues concerned with the educational policy can be identified only in two articles (POED 1986, p. 2 and 1987, pp 17-21) whereas no article is focused on POED's opinion on any mathematical innovation. In addition, only one article was focused on teachers' professional development (POED 1970, p. 1) and expressed POED's requirement for the establishment of an institute responsible for INSET. Finally, only one article of the then second general secretary (Stylianou 1985, p. 20) argued that the trade union should have a real role in the process of decision-making and should participate at the

development of the curriculum policy. Thus, the teachers' trade union has never focused its attention on teachers' professionalism in contrast with its interest in teachers' appraisal.

This role of POED is, however, in contrast with the considerable power of the NUT in the formulation of educational policy of England in 1970s (Manzer 1970) which has now shifted in the contribution of English trade unions to the current debate on curriculum reform through commissioning a range of research on the reform process. This restricted role of POED had implications for the process of curriculum change in Cyprus since inspectors (eg Theodorou 1980) and Ministers (Sophianos 1978) asserted that the Department of Primary Education cooperated harmoniously and systematically with POED for the development of curriculum policy. However, Baron (1970) found out that Cypriot teachers were enthusiastic in applying innovations because teachers' appraisal depended on whether they are able to apply the curriculum policy. This implies that government's attempt to bring in curriculum change is based on contractual rather than professional accountability. Nevertheless, Theodorou (1980) claimed that teachers accepted the classic objectives model adopted by ministry officials for the design of the 1981 curriculum and that justified their decision. This argument is not based on any research evidence but reveals inspectors' assumptions about the process of curriculum change and particularly about the notion of curriculum control. Thus, such interpretation of

the notion of professional accountability is very restricted.

In supporting this argument, it is worth exploring the inspectors' role in the process of curriculum change in order to identify implications for the function of accountability in the process of change in Cyprus. The Ministry of Education (1990) points out that:

> Guidance and supervision of teachers is conducted by the inspectors who are charged with the guidance, the supervision and the evaluation of teachers' work. ... Guidance is also provided through handouts prepared by the members of the inspectorate and Departmental committee. (para 1.4.9.4)

Thus, inspectors can control the design of the curriculum, the implementation through provision of guidelines and advises to teachers for problems with implementing the curriculum policy and by teaching in INSET courses of PI, and finally the "evaluation" by being responsible for teachers' appraisal. Inspectors' role is, therefore, considered as crucial and teachers' professional commitment to the formation and "evaluation" of curriculum policy is not a policy option.

The underlying notion of accountability has nothing to do with children's achievement but teachers' appraisal. Teachers are not accountable on the basis of their children's achievement but on whether they can implement the pedagogy and innovations supported by inspectors. This consideration of accountability, as not related to standards, can not be easily identified in any other country

(Skilbeck 1990) and it can be attributed to the fact that the educational system in Cyprus is highly centralised. This assumption is supported by the fact that English but not Cypriot policy documents encourage the idea that schools should take account not only of policy decisions of LEAs and government, but also of the expectations of parents, employers and community at large (eg DES 1989a, paras 8-10). However, neither English nor Cypriot policy documents suggest that the development of the curriculum at the local level should be seen in terms of pupils' and parents' role (Winkley 1988, p. 11).

Nevertheless, Leese et al (1960) argue that curriculum should be considered as a "social policy" designed to satisfy pupils' needs and parents' expectations. In addition, Fullan (1982, p. 155) supports the idea that teachers should think of children as participants in the process of curriculum change. For this purpose, Torrance (1989) illustrates a dialogue between teachers and pupils which can be seen as a reflection on the process of learning. It can be claimed that such dialogue can be used by teachers to identify their pupils' needs, interests, plans and ambitions. Information gathered from this dialogue can be, therefore, used to guide curriculum development (Blanchard 1988).

The advantages of involving parents in the process of curriculum development can be seen in research findings showing that involving parents in instructional tasks (in the classroom as aides) has positive effects on learning

(Fullan 1991, Rosenholtz 1989b, p. 152; Mortimore et al 1988). Furthermore, there is a need for getting information on pupils' behaviour, skills and knowledge in terms of other aspects of their life. For example, an evaluation system providing evidence about pupils' achievement in relation to the classroom pedagogy and curriculum only, ignores the learning which takes place at home.

Since parents do not want to "invade" the schools (DES 1977), they can be involved as partners in teachers' educational tasks (Lightfoot 1978). In addition, pupils may develop a sense of ownership and investment in what they are doing which provides motivation for learning (Pollard 1991). It is therefore an effective strategy in the process of change to involve parents and pupils and to find out about their expectations and the help which they are able to provide in the process of improvement the pupils' learning and the curriculum.

However, Cypriot policy documents encourage only teachers' accountability to policy decisions of the government. Moreover, although English policy documents promote the rights of those who "use" the system, they have not provided any analysis of the effect of treating teachers as accountable to parents and pupils. The need for such analysis is particularly important since much has been written about a movement towards a more centralised system in England (Travers 1988).

It should be finally mentioned that the fact that English, but not Cypriot, teachers are accountable to parents has some implications for the difference between assessment policy in England and Cyprus. The use of summative assessment to ensure the implementation of National Curriculum has led to the risk that it becomes an assessment-driven curriculum (Goldstein 1991). This possibility can be also seen in terms of the recent requirement (DES 1992c and 1992e) for heads to be responsible for his/her school assessment results. This implies that English policy-makers are moving towards a model based on the idea that contractual rather than professional accountability can ensure the implementation of change. Thus, although English and Cypriot policy makers see contractual accountability from a different perspective, contractual accountability seems to be used in both cases to ensure the implementation of change.

The need for using professional accountability as a way to ensure the implementation of change may be seen in terms of the difficulties of using contractual accountability. These difficulties emerged both in attempts of Cypriot inspectors to make sure that teachers use the active pedagogy encouraged by them (Appendix A) and in attempts of English policy makers to develop an effective form of recording which could ensure that teachers were accountable to both government and parents. A variety of forms of record-keeping with very detailed check lists were developed but not all were manageable or cost-efficient (DES 1989c, 1990a, 1991b, 1991d). It was also suggested by all the documents that

carefully selected materials should be included since this might be particularly useful for reporting to parents. A well established tradition of verbally reporting to parents was revealed but it was suggested that teachers should plan for both oral and written reports in the future (DES 1991d, para 18). This reveals the difficulties of developing an effective reporting system to parents which can ensure the function of contractual accountability (see Pring 1978) in England.

5) Evaluation of Curriculum Reform

"Judgement" is the key term in any discussion of curriculum evaluation. Judgements have to be made about when to evaluate, how and with what end in the view. Curriculum change has been considered in the context of what is to be taught and learnt and with what success it has been learnt (Gibby 1978, p.166), so that links between curriculum change and curriculum evaluation can be identified. This section examines the ways used by Cypriot policy makers to evaluate curriculum policy. It also attempts to draw implications for the evaluation of curriculum policy in Cyprus from the issues raised by the early attempts of English policy makers to evaluate the implementation of the National Curriculum and its assessment. Its focus is on the mechanisms developed for its evaluation. Issues raised in this section are therefore inevitably concerned with curriculum decision-making and the management of curriculum change.

Cypriot policy documents have not defined criteria upon which the evaluation of current curriculum reform could be based. However, implicit criteria could be reflected in policy documents arguing that social change and particularly technology should affect the curriculum. The following four issues are exclusively related to the evaluation of the Cypriot curriculum policy. First, the lack of research and educational debate affects the way in which curriculum evaluation is conducted in Cyprus. Karagiorges (1986) argued that

> "a weak point of education development is that no systematic scientific evaluation has been applied to new procedures and methods accepted and implemented in schools" (p. 89).

Second, an implication from the lack of any research for the evaluation of curriculum change is that no innovation has been designed for the specific conditions of Cyprus. The role of research is very restricted and has no impact either on policy formation or on pedagogical debate. This implies that there is lack of serious consideration of the complex process of change which should be based on a diagnosis of the need for change from participants. In addition, there is no arena for professional criticism of either curriculum policy or centralised system. The lack of such criticism supports people's perceptions of inspectors as experts of curriculum change and of teachers as those who have merely to deliver the curriculum. Thus, the educational system in Cyprus remains highly centralised and matches with what Schon (1971) has described as a "stable state". The Ministry of Education in 1974 accepted that:

> "research is needed for the evaluation of the programmes which will lead to a scientific approach, which will be a more costly approach, but less costly in the long run in the effective running of the educational system" (Council of Europe 1974, p. 35)

However, since then nothing has been done and suggests an unwillingness to change that situation.

Third, there is a conflict between the lack of an evaluation policy and the adoption of the objectives model for policy formation which is supposed to adopt the classical or experimental model of evaluation (Lawton 1978, p. 177).

Finally, a comparison of the evaluation of curriculum reform in England and Cyprus reveals that although a highly centralised system could be expected to be particularly interested in evaluation of curriculum reform, the lack of a systematic evaluation is more obvious in Cyprus since no survey or report prepared by inspectors or change agents has been used to justify the need for any curriculum change. In England, the agencies that are concerned with the process of curriculum reform (NCC, SEAC) have funded a large number of projects to monitor the process of curriculum change though they control publication of these evaluative reports. In addition, surveys conducted by HMI provide a national picture in teaching Mathematics. There is no systematic attempt either to research or to evaluate the implementation of curriculum policy in Cyprus and hence officials of the Ministry of Education do not get any feedback from the implementation of curriculum policy whereas in England there

is research and an attempt to consult with teachers and evaluate the implementation of the National Curriculum.

Issues concerning the pace of change (Hoyle and Bell 1972) and the concept of the "implementation dip" (Fullan 1991) are related to the difficulties of the first stage of change. The pace of current curriculum reform is criticised by surveys indicating that too much needs to be done in short time (e.g. DES 1989c; 1990; 1992a, para 13; NCC 1991c, p. 5). Similarly, educationalists have argued that the rate of curriculum change in England was more rapid in the late 1980s than at any other period (O'Hear and White 1991, Goldstein 1991, Rudduck 1991, p. 30 and Lawton 1992). This has significant implications for policy since consultative, discussion documents and surveys criticised changes for which no adequate and necessary preparation and support was provided (DES 1982b, 1987b, 1989c, 1990). On the other hand, the importance of the notion of the "implementation dip" was recognised by only one survey indicating that:

> "improving the curriculum in order to raise standards, especially methods of teaching, learning and assessing and recording, is a gradual and long-term process" (DES 1992a, p. 9).

Thus, analysis of the attempts to evaluate curriculum reform in England reveals that neither the pace of curriculum change nor the "implementation dip" has been adequately taken into account during the "formation" of curriculum reform in England. It also reveals that these two issues should be taken into account in attempts to evaluate curriculum policy in Cyprus.

6. Research Agenda

The importance of teachers' perceptions of curriculum policy has been identified in the preceding review of the literature and especially in terms of the following six issues. First, comparison of the models of curriculum change used in England and the current model of curriculum change followed in Cyprus revealed that there is a need for developing a model of curriculum change based on teachers' developmental role in the process of change. Exploration of teachers' perceptions will contribute to attempts to involve teachers in the process of formation and evaluation of curriculum change in Cyprus. Second, educationalists and English policy makers argued for the need to develop a link between teachers' professional development and curriculum change in order to change teachers' perceptions and confidence for teaching the requirements of curriculum policy. Third, although Cypriot policy makers did not systematically attempt to link teachers' professional development with curriculum development, there was an attempt to link two INSET courses on assessment and problem-solving in Cyprus with curriculum reform in Mathematics.

Fourth, theories of curriculum change concerned with teachers' thinking, teachers' role and teacher professionalism revealed the importance of examination of teachers' perceptions for any attempt to bring about curriculum change. Fifth, Cypriot and English inspectors claimed that they are interested in teachers' professional commitment to the process of change. Sixth, the first

evidence derived from surveys conducted after 1988 in England which attempted to evaluate curriculum reform revealed that approaches to teaching mathematics were not likely to change unless teachers' perceptions of teaching Mathematics changed. Thus, research on Cypriot teachers' perceptions of curriculum policy may contribute to attempts to evaluate current curriculum reform in Mathematics.

The review of the literature has also shown that examination of the following four factors influencing teachers' perceptions is necessary for any attempt to evaluate curriculum reform and this influenced the way in which I designed my research. First, the effect of teacher training (both ITT and INSET) upon teachers' perceptions is taken into account since teachers' development may change their perceptions. Yaxley's (1991) attempt to link teachers' professional development with their theories of teaching suggests that INSET may become a factor able to clarify and develop their perceptions. Second, my research attempts to link the effect of ITT with that of length of teaching experience in order to evaluate the effect of ITT upon teachers' perceptions. This is supported by findings of research into teachers' thinking showing that the effect of the former is less significant than that of the latter (Calderhead 1987).

Third, the different strategies which policy-makers in England and Cyprus used to ensure the implementation of curriculum policy were attributed to the effect of central control. Thus, the intention to develop a new model of

curriculum change in Cyprus based on the importance of teachers' perceptions should take into account the effect of the central control.

Finally, there is the question whether school-based curriculum development can be developed in a centralised system like that of Cyprus. Since it has been shown that the SBCD depends on the various sources of influences on curriculum practice, the effect of political (eg inspectors and policy documents) and professional (eg heads and colleagues) factors upon teachers' perceptions and their classroom practice should be examined. The examination of these factors may help to develop a new model of curriculum change in Cyprus.

For these purposes, the following seven issues, required further exploration.

1) Cypriot teachers' perceptions about common issues of Mathematics pedagogy supported by curriculum policy in Cyprus (Active learning, practical work, cross-curricular approach, curriculum organisation) and their implications for this policy.
2) Cypriot teachers' perceptions about the different value attached to different purposes of teaching Mathematics and purposes of assessment and their implications for curriculum policy in Cyprus.
3) The connection between policy on the curriculum and policy on assessment and its reflection in teachers' perceptions about teaching and assessment.

4) Cypriot teachers' perceptions about different methods of assessment in mathematics derived from analysis of assessment policy in England and Cyprus, and their implications for assessment policy in Cyprus
5) An exploration of the influence of initial training and different INSET courses offered in Cyprus upon teachers' perceptions of the four preceding issues. These will be linked with an exploration of the influence of length of teaching experience upon their perceptions.
6) An exploration of the effect of political and professional influences upon teachers' perceptions, and their implications for developing school based curriculum in Cyprus.
7) The association between different forms of control over curriculum and assessment and teachers' perceptions.

These issues provide the framework of this research and establish a link between the review of the literature with the study that has been carried out.

CHAPTER 4: METHODOLOGY

1. INTRODUCTION: JUSTIFICATION OF METHODS CHOSEN

Given that the purpose of my research is to investigate teachers' perceptions and the factors that influence them, I now turn to the research methods chosen to gather data about those perceptions and to methodological issues arising from the study.

Having in mind Lewin's (1990) conclusions, derived from her fieldwork in Malaysia and Sri Lanka, that "there were neither good nor bad methods but simply those more or less suited to particular purposes", (p. 141), I will attempt to show the connection between the research methods adopted and my purposes.

It is impracticable to collect data on perceptions by direct observation. Selltiz et al (1981) suggest that in such a case "interviews and questionnaires are commonly used to gather information", (p. 146). They also suggest that:

> "Most social research, including surveys, aims at establishing the kind of understanding of social processes that ultimately will lead to general laws explaining the processes, while much survey research is aimed at establishing facts and relationships that are prior to the casual laws". (p. 66).

It was therefore decided to use a combination of interviews and questionnaires to measure teachers' perceptions about aspects of policy on reform in primary Mathematics and identify differences of perceptions between groups of teachers, linked to possible factors affecting these

perceptions. Complementary exploration of these factors was attempted through the collection of qualitative data by interviews. These are described and discussed in Chapter 6.

1.1) The Questionnaire Method:

The reasons for using questionnaires are four. Firstly, questionnaires can be used as a means of collecting information from a wider sample than can be reached by personal interview, and therefore they could provide information about the perceptions of a large number of teachers. This enables the identification of the perceptions of a whole group, and whether issues are accepted or rejected by the great majority of teachers. Secondly, the quantitative data from a questionnaire enables comparison to be made between groups, in this case the perceptions of different groups of Cypriot teachers and the perceptions held by English and Cypriot beginning teachers. Thirdly, questionnaires can provide for anonymity, and therefore, within some limits, improve the validity of the research. Finally, questionnaires can focus on highly specific issues, in this case information about teachers' perceptions of particular aspects of curriculum policy presented in the second chapter.

The last point raises the issue of the content of the particular questionnaire and its origins. The questionnaire (see Appendix B) dealt with the following five topics in Part B:

a) Purposes of teaching Mathematics (Item 13)

b) Purposes of assessment (Item 14)

c) Methods of teaching and assessment defined as "good practice" in primary Mathematics (Items 15-26) and the appropriateness and ease of different techniques of assessment (Item 35)

d) The process of change (Items 27-34, 37) with special reference to the perceived effect of curriculum policy on teachers' own teaching (Items 27, 32-34, 37) and

e) Ways of improving assessment (Item 36).

The content for these sections was created from the analysis of curriculum policy documents in Cyprus provided earlier, and to a limited extent in England, and from the ways inspectors perceive the process of change. This analysis led to the identification of the following six key issues for curriculum policy in Cyprus.

First, there was concern over the purposes for which assessment should be used and especially whether it should be summative or formative (DES 1987b, para 23; Kimberley et al 1990, p. 236; Brown 1991, pp 217-218).

Second, a decision to ask respondents to rank the purposes of teaching Mathematics was taken in the light of the analysis (see p. 37) of the purposes of teaching Mathematics and with the lack of a clear consideration of the nature of Mathematics, in policy documents.

Third, the kinds of pedagogy considered important for the delivery of the curriculum were derived from analysis of the issues of Mathematics pedagogy promoted by policy documents

and Cypriot inspectors. Issues associated with this pedagogy are also illustrated at Table 2.1.

Fourth, given the subject-based curriculum, and its assessment and reporting in subject terms as well as the analysis of the problematic consideration of cross-curricular approach from curriculum policy of both countries, perceptions of cross-curricular approaches in Mathematics need to be explored.

Fifth, the assumption that some techniques of assessment are more appropriate than others is explored, given the emphasis on written tests of assessment policy in Cyprus. In addition, an examination of the relationship between the appropriateness and ease of a range of other assessment techniques was needed, given the evidence about problems of manageability of national curriculum assessment (DES 1989b, NCC 1993, Blyth 1990b, Campbell et al 1991, Campbell and Neil 1992).

Finally, there are items concerned with the ways policy-makers use to ensure the implementation of the curriculum policy, identified in Chapter 3. As a consequence, Items 27, 33 and 34 deal with issues related to the notion of curriculum control and attempt to evaluate the perceived effect of curriculum policy at the school level. The issue of collaboration among schools, their communities, and inspectors can also be identified in Items 33 and 34. Furthermore, Item 28 has to do with the importance of teachers' perceptions for the process of curriculum change

and covers the role of teachers' perceptions in the formation of curriculum policy. Moreover, the role of professional development in the process of change, identified in pages 94-103 can be explored both by comparisons between perceptions of sub-groups of Cypriot teachers and from their perceptions about Item 29. Items 30 and 37 examine whether the demands of curriculum policy are seen as feasible by teachers.

The content of the questionnaire was affected not only by the review of the literature but also by unstructured interviews with 20 teachers. The purpose of these interviews was to gain some insight into the perceptions of the interviewees about issues they considered as crucial for their practice. Details about the main consequences of these interviews for the design of the questionnaire are given in Appendix G. It can be argued that the use of the review of the literature and interviews for the design of the questionnaire can be seen as a kind of triangulation since findings from one were checked by findings from the other.

The population for the questionnaire can be classified into the following four groups:

1) A randomly selected sample of 10% of teachers of primary schools in Cyprus which can be used to identify the perceptions of Cypriot teachers in general.

2) All the teachers in a stratified sample of five primary schools in Cyprus. These five primary schools have a relatively large number of teachers to allow within-schools and across-school comparison. Conway (1967) argues that

"stratified samples have smaller sampling errors than simple random samples of the same size" (p. 129). This is particularly true when the size of sample is relatively small. Thus, the different socio-economic background, the schools' location {two next to the "green line" (the area which is very close to the occupied part of Cyprus), two in small and two in big villages, and a city school}, the heads' special interest on Mathematics (two of them had a specialist head) were taken into account for the selection of these five schools. These schools can not be considered as representative of the Cypriot primary schools, as a whole, but were chosen to examine the school effect.

3) All the Cypriot teachers who graduated from PAC in July 1991. This group was used to examine the effect of initial teacher training (ITT) upon perceptions by comparing them with data gathered from a previous study (Kyriakides 1992) concerning their perceptions when they were at the end of their ITT.

4) All the English teachers with one year's teaching experience who graduated from University of Warwick in July 1992. This group was used to explore cultural factors, including the influence of centralised control, upon teachers' perceptions by comparing them with the third group (ie Cypriot teachers with one year of teaching experience). A comparative perspective on the ITT effect was attempted by drawing evidence from the previous study, and using it as a baseline of perceptions.

Details about characteristics of the samples and statistical tests used are given in the next section. The reasons for choice of statistical tests are given below in Section 3.

1.2) The Interview Method

A) Purposes of the interviews

In carrying out the interviews with teachers of five primary schools in Cyprus and Cypriot beginning teachers, I had the following five purposes. The first four were related to the use of both questionnaire and interview methods for collection of quantitative and qualitative data to explain more fully and study from more than one standpoint teachers' perceptions of curriculum reform in Mathematics. Methodological issues related to the use of triangulation are analysed further in the last section of this chapter.

1) Implications of the questionnaire responses for Curriculum Practice

First of all the fact that the questionnaire deals with highly specific information did not allow me to find out the meanings behind their perceptions. For instance, acceptance of a cross-curricular approach in Mathematics derived from Item 22 of the questionnaire, does not allow me to identify what each teacher actually understood by using the term cross-curricular approach. The interview, on the other hand, can help us to clarify such perceptions. For example, the correlation between teachers' perceptions of the purposes of teaching and the methods of teaching and assessment emerged from quantitative data according to the value of the Spearman Correlation Coefficient. The qualitative data, however, provided illustrations of the link through the

classroom examples elicited which showed implications of the correlation for classroom practice.

2) Did teachers have the issues raised by the questionnaire in their minds?

Secondly, the fact that the questionnaire asked for specific information did not allow me to see whether each teacher actually had that issue in his/her mind as really important or whether the questionnaire item had suggested it to him/her. This is obviously related to the issue of the validity of the two methods, illustrated in detail at the fourth section of this chapter. For example the item requiring ranking of the purposes of Mathematics did not allow me to see whether the teacher had ever thought about the importance of the role of talk for teaching Mathematics. As a consequence, the use of an open-ended question during an interview about the purposes of Mathematics would allow me to classify the purposes as defined by the interview, rather than by the questionnaire.

3) Identification of perceptions of issues not raised by the questionnaire.

Thirdly, the use of a semi-structured interview might provide information on issues not raised by either the review of the literature or the questionnaire. Such issues have been identified and presented in Chapter 6 and clarified in Chapter 7.

4) Examination of validity

Fourthly, the validity of the findings can be tested by matching the qualitative data derived from interview with

each teacher against the quantitative data gathered by his/her individual questionnaire.

5) The effect of school policy upon perceptions.

Interviews with teachers of the five schools were designed to identify whether any school policy was developed and explore ways within which this policy influenced teachers' perceptions of teaching and assessment in Mathematics. In addition, interview data concerned with teachers' views of school policy could be compared with findings of documentary analysis on materials published by the schools.

1.2 B) Structure of Interviews

Two different structures were used to control the interviews and to provide a basis for the selection of themes emerging from the interview data for analysis. The full schedules can be seen in Appendix C.1. The following four topics were used in the interview with both groups of teachers and consisted of four open-ended questions.

B.1) Topics examined by every interviewee

The first topic concerned the purposes of teaching Mathematics (Question 1) and a check list of the following four purposes from Item 13 of the questionnaire (Gain knowledge of basic concepts, engage in practical investigations and problem solving, develop positive attitudes to Mathematics and talk about Mathematics). The second topic was about the purposes of Assessment (Question 2), and a check list of the following four purposes from Item 14 of the questionnaire (Formative, summative,

teachers' appraisal and self-evaluation, and the use of the results by the government), as well as the issue of how the assessment results can be used. The third topic was related to definitions of "good practice" in teaching Mathematics (Question 3) linked with questionnaire Items 15, 18-22, and 25. The fourth was about ways of assessment (Question 4) taking into account issues related to its relation to teaching and the different techniques of assessment. As a consequence, a check list including Items 16, 23, 24, 26, 35 and 37 of the questionnaire was used.

B.2) Topic analysed by teachers of five schools

The fifth topic can be identified only in the interview with teachers of the five primary schools in Cyprus and is concerned with the development of a policy in Mathematics in their schools and their perceived importance of the need for having such policy (Question 5). This issue was explored further by a follow-up question concerned with the factors they thought influenced their ways of teaching. The final part of this interview (Question 6) was concerned with the notion of "psychic reward" and links with the process of change are discussed in Chapter 7.

Details about the sample, the treatment of the data, and their analysis and reporting are given in the third section of this chapter. By using both methods of data collection, it was possible to gather specific information about teachers' perceptions of curriculum policy, and also in depth information about the ways each teacher understood the same term. Each method provided a check against the other.

It was therefore possible to identify group perceptions and factors influencing them using data derived from two different methods. This is directly supported by Sammons' (1989) observation that "some of the most fruitful research involves a combination of methodological approaches" (p. 33), and by Oppenheim's (1968) suggestion that "sometimes there may be good reasons for asking the same questions both in open and closed form".

2. INSTRUMENTS, DATA COLLECTION AND DATA ANALYSIS

The following table shows the sequence and methods of data collection. It illustrates what was done and when. It also provides evidence about the samples involved in this research and the number of teachers who replied to the questionnaire, which are analysed below.

Table 4.1 : Research instruments and response rates

	Research Instrument	Number of Populat.	Number of Replies/ Surveyed	Kind of sample	Date
1	Questionnaire	2570	185/257	10% Rand/ly Selected	April 1992
2	Questionnaire	51	50/51	Teach. of 5 schools	April 1992
3	Questionnaire	123	101/123	First Year teach.(PAC)	April 1992
4	Questionnaire	94	62/94	Students Warwick	March 1992
5	Questionnaire	83	51/81	First Year teach.(War)	April 1993
6	Interview	123	10/10	First Year teach.(PAC)	April 1992
7	Interview	51	10/10	Teach. of 5 Schools	April 1992

Further details of the questionnaire sample are given in Table 4.2 presented in the next page.

Analysis

The data from the questionnaires were analysed using the SPSS-X package and the following statistical tests, correlations and procedures:

a) Kendall's Non-Parametric test for analysing responses to items 13, 14, 35, and 36.
b) Chi-square test for the identification of differences among groups' characteristics and differences on perceptions of item 32, and 37.
c) T-test for the identification of differences between two groups perceptions of item 31, 33 and 34
d) Kolmogorov-Smirnov two-sample test for the identification of differences between two groups perceptions of Items 13-30, 35 and 36.
e) One way analysis of variance (ANOVA) for the identification of differences of perceptions among more than two groups about items 31, 33 and 34.
f) The Kruskal-Wallis one-way analysis of Variance for the identification of differences of perceptions among more than two groups concerned with items 13-30, 35 and 36. The multiple-comparison technique was used to determine which group differences are significant (Siegel and Castellan 1988, p. 223).

Table 4.2 - Characteristics of the groups of Cypriot teachers responding to the questionnaire

Characteristics	General Sample Frequen	Percen	Beginning Teachers Frequen	Percen
SEX				
Male	77	42	6	6
Female	107	58	95	94
Years of Teaching Experience				
1	4	2	101	100
2-5	57	31	-	-
6-10	21	11	-	-
11-20	28	15	-	-
21-	75	16	-	-
Size of Class				
Less than 21	44	24	34	34
21-24	39	21	18	18
25-28	51	28	24	24
29-32	34	18	18	18
33-36	17	9	7	7
Age of Pupils				
Year 1	37	20	54	54
Year 2	43	23	35	35
Year 3	43	23	14	14
Year 4	41	22	21	21
Year 5	29	16	6	6
Year 6	31	18	5	5
Cycle				
A	99	54	74	73
B	76	41	18	18
A+B	10	5	9	9
Number of Age groups in a class				
1	164	88	81	80
2	14	7	13	13
3	1	1	4	4
4	3	2	-	-
5	1	1	2	2
6	2	2	1	1
ITT Qualifications				
PAC (3 years)	115	62	101	100
Two-years train	65	35	-	-
Other	5	3	-	-
Specialised Courses in mathematics				
ITT	6	3	6	6
INSET	69	37	12	12
ITT and INSET	13	7	-	-
NONE	97	53	83	83

g) The method of least square was used for the identification of correlations between perceptions of appropriateness and ease of techniques of assessment.

h) The Spearman correlation coefficient was calculated for the following two cases: a) Purposes of Mathematics and relevant methods of assessment (Item 13d with 26 and Item 13c with 24) and b) Purposes of Mathematics and relevant methods of teaching (Item 13d with 25 and Item 13a with 20).

i) Cluster Analysis was used to identify homogeneous groups of teachers according to their responses to items 31, 33, and 34.

j) Factor Analysis was used to identify underlying "factors" that explain correlations between teachers' responses to the six sources of influence of practice presented in item 33.

A rationale for choosing these statistical tests and these coefficients is given below, whereas the use of Cluster Analysis and Factor Analysis are analysed in Chapter 5.

The interview data were analysed by listening to the tapes and allowing issues to emerge within the structure of the interview schedule, (Appendix C.1) as is suggested in the following section (3.2). The interview schedule itself was created from the same analysis of policy issues as the second section of the questionnaire and according to its specific purposes analysed above.

3. RATIONALE

3.1 Questionnaire

Having decided to use the questionnaire method for the reasons presented above, my next step was to find and list the specific objectives that the information would achieve. The objectives were based mainly on the research problems which have been presented in the first chapter. It was, therefore, attempted to find out the teachers' perceptions about the purposes of Mathematics and assessment, the ways of teaching and assessment in Mathematics, the curriculum reform, with reference to difficulties of its implementation and, finally, ways of improving assessment. These objectives attempted to be achieved by the items in Part 'B' of the questionnaire (Appendix B). Thus, I started to think of how to construct my questionnaire. My decisions, which derived from this procedure, can be classified into the following four categories, suggested by Selltiz et al (1981):

a) Decision about question content
b) Decision about question wording
c) Decision about form of response to the question
d) Decision about the place of the question in the sequence

However, decisions related to one category were partly influenced by the others.

There were five dilemmas to be faced. First, according to McMillan and Schumacher (1989) I had to keep the questionnaire as short as possible in items and responses. However, its objectives, and especially the identification of the teachers' perceptions about the ways of teaching and

assessment, required a lot of items. For this reason, I decided to ask them only about the most important topics, as they had been identified in the analysis of curriculum policy in Cyprus and England.

The second dilemma is also related to the need of having a fairly short questionnaire. The purposes of this study were broader than a previous study (Kyriakides 1992) concerned with teaching and assessment in Mathematics, in which the questionnaire proved to be very lengthy. It was possible to omit four items previously included, which were not relevant to the purposes of this research.

The third dilemma concerned perceptions about the purpose of Mathematics and assessment (Items 13 and 14). Since I did not want to create a very long questionnaire, I had to choose between having items related to teachers' agreement about each purpose or items asking them about their importance. My final decision was based on the fact that I was interested in finding out and comparing the most important purposes. Although, according to Smith (1975), "leading questions" must be avoided and according to the findings from interviews with student teachers (Kyriakides 1992) purposes 13a, 14a and 14d were not considered as appropriate by all the students, Items 13 and 14 were designed to compare the relative value of the different purposes in teachers' perceptions.

The fourth dilemma related to the Item 35, where eight assessment techniques had to be ranked twice. The big number

of techniques obviously created difficulties in answering this question. Such difficulties were identified among student teachers in my previous study (Kyriakides 1992) and among teachers during the pilot study of this research (see p. 146). However, it was not easy to exclude any of these techniques, since each one has its special characteristics, and exclusion would reduce comparability with the previous research. For this reason I decided not to change this question, but to include it towards the end since, according to Selltiz et al (1981), "it is usually best to start with simple questions", (p.177). As a consequence, teachers would find it very easy to answer the questions in Part 'A' and had the motivation to answer Items 13-34 (which are also quite easy) and at the end to answer the least easy questions.

Finally, I avoided the use of negatives in statements, because they sometimes confuse respondents, and varied the ideological position in the items to deter a predictable patterned response set. Following this procedure teachers would not consider that either my perception or my expectation was in favour or against a particular policy or pedagogy. It is also possible that teachers would have to think more carefully about each item before answering it.

The above analysis of the procedure of my questionnaire design is mainly focused on the dependent variables of this research. Oppenheim (1968) points out that "these variables have to be carefully measured and group differences tested for statistical significance" (p. 10). The identification of

differences between perceptions of the four samples and the sub-groups within them is therefore important. Since it is possible that the differences among the four samples could be due to the differences of their sub-groups' perceptions, I decided to include the independent variables (Part 'A') to identify the characteristics of each group and to study their effects.

Before I gave the questionnaire to the teachers I wrote an introductory paragraph which, according to Nisbet and Entwistle (1970):

> "... should first explain the reason for the inquiry. This reason should be expressed in terms of values which are relevant to the sample ... emphasising the use of importance of the information asked for. A sentence on the importance of the respondent's own contribution is also appropriate". (pp 50-51).

In the light of their suggestion I attempted to write a short introductory paragraph to persuade my sample to complete and return the questionnaire.

Pilot study and Administration of the Questionnaire

My next stage was to pre-test the revised questionnaire as a pilot (Evans 1986, p. 51) to see how it worked and whether changes were indicated. The questionnaire was piloted by distributing it to twelve Cypriot teachers. Seven of them were first year teachers and five were teachers of the five sample primary schools of Cyprus (one from each school). In the light of their comments minor amendments were made, particularly where the structure used was not easily

comprehensible or terms which had been used were not familiar to them.

The difficulties identified by them in completing the pilot questionnaire, concerned mainly Items 35 and 36 where the ranking of many items made the answering of the items time-consuming. Thus, the fact that missing cases of these items were more than those of others can be attributed to the reason identified during the pilot study. In addition, teachers found particular difficulties in answering Item 37 since they had no experience on how pupils' self-assessment could be done. However, I decided to retain this also because this issue is particularly emphasised by assessment policy of Cyprus (p. 35). Thus, the main consequence of the pilot study for the design of the questionnaire had to do with the sequence of the items included in the questionnaire.

At the next stage of my research, I visited the five schools chosen to be used for my study in order to inform heads and teachers about my study. I was warmly welcomed by all of them and this is probably due to the fact that educational research, particularly qualitative research, rarely takes place in Cyprus. One teacher from each school took part in a pilot study evaluating the questionnaire and the structure of the interview I was going to use with them. In addition, heads gave me access to documents produced by their schools in respect to the development of a school policy in Mathematics. The heads were particularly helpful and promised to send me copies of everything which they were

going to publish in the academic year 1991-92 and particularly reports of the staff meetings.

The final stage of my research in Cyprus was conducted in April 1992. Table 4.1 shows that questionnaires (N=431) were sent to the following three groups of Cypriot teachers: a) 257 of them were sent to randomly selected sample of 10% of Cypriot teachers following Conway's (1967, p.128) suggestion for systematic sampling, which involves choosing names at regular intervals (in this case every 10) from an alphabetical list of teachers' surnames. b) 51 questionnaire were sent to all teachers of the five primary schools in Cyprus mentioned above. c) 123 questionnaires were sent to the whole group of teachers who were at the end of their first year of teaching experience. In April 1993, 81 questionnaires were sent to the whole group of English teachers who graduated from Warwick University in July 1992. Their perceptions had been also investigated when they were at the end of their ITT in March 1992 by 93 questionnaire administered to them by their tutors, who asked them to return the questionnaires in a week's time. All the teachers were asked to return the questionnaires using the stamped envelope which I had enclosed.

It was not possible to control the conditions in which the questionnaire were completed and it is an assumption that they were completed independently.

Table 4.1 shows that 185, 50 and 101 teachers of the first, second, and third group of Cypriot teachers respectively

answered the questionnaire, meaning that the response rates were 72%, 82%, and 98% respectively. 62 and 51 questionnaires were answered by the English teachers in 1992 and 1993 respectively, meaning that the response rates were 68% and 63% respectively. Each of the Cypriot samples' response rate is at the level of 70% and this implies that the findings do not lack validity for general application to their population, (Nisbet and Entwistle 1970, p. 52).

Is the randomly selected sample of 10% of Cypriot teachers representative of the whole group of teachers?

The fact that those who had replied were representatives of their populations can be seen by using figures of Table 4.2 (see p. 139a). This table shows the absolute frequencies and the percentages of the various sub-groups of teachers who replied. It has been derived from the stage before the statistical analysis, in an attempt to prove that non-respondents were not a special sub-group of teachers. This attempt was particularly important for the randomly selected sample of 10% of Cypriot teachers, since generalisation of findings derived from this group is attempted.

Thus, comparisons of figures about the whole group of Cypriot teachers during the school year 1991-92 (Ministry of Finance, 1993) indicating their years of experience (Table 13, p.116), the age groups of pupils taught by them (Table 12, p.115), the size of their classes (Table 12, p.115) and sex (Table 13, p.116) were compared with the characteristics of my sample defined by questionnaire Items 2, 10, 9 and 1 respectively. The fact that Items 1 and 10 were measured at nominal level implies that chi-square test for two

independent samples had to be used. Their values (X^2=2.02, df=1, p<.17) and (X^2=7.18, df=5, p<.20) suggest that my sample does not differ with respect to sex and age groups of pupils taught by them, respectively, from its population. On the other hand the ways Items 2 and 9 were designed, provided ordinal data. Thus, the Kolmogorov-Smirnov two-sample test was used and reveals that the whole group of Cypriot teachers does not differ from this sample with respect to years of teaching experience (K-S Z =1.15, D=0.041, p<.30) and the size of classes they taught (K-S Z =0.89, D=0.036 p <.40).

The representativeness of this sample was also measured by exploring patterns across it which usually exist in the educational system of Cyprus. The fact that male teachers usually teach older pupils whereas female teachers teach younger pupils was explored across the characteristics of the sample of this study. The chi-square test indicates that there are statistical significant differences among male and female teachers of my randomly selected sample, according to the year groups of pupils they taught. Year 1 and Year 2 pupils were mainly taught by female teachers whereas Year 5 and Year 6 pupils by male teachers. These findings were supported by chi-square test where female and male teachers grouped into those who teach at Cycle A (similar to Key Stage 1) and Cycle B (similar to Key Stage 2) were compared. All these variables were measured at nominal level and this justifies the use of chi-square test. Values of chi-square test, derived from such comparisons, are illustrated in Appendix D (Table D.1).

Moreover, the fact that usually Cypriot teachers with few years of experience teach in Year 1, whereas teachers with many years of experience teach in Year 6 was also identified across my randomly selected sample by using the Kolmogorov-Smirnov two sample test. Similar findings were derived by classifying them into teachers of Cycle A and teachers of Cycle B. The use of this test is due to the fact that the way years of experience have been measured by the questionnaire (Item 2) produced ordinal data. Obviously, this kind of comparison could not be examined by the figures derived from first year teachers. It has been however identified by comparing figures of Table 4.2 concerned with age of pupils the randomly selected sample and the first year teachers respectively had to teach. Values of Kolmogorov-Smirnov two sample test derived from comparisons suggested here are illustrated in Tables D.1 and D.2 (Appendix D).

Finally, the fact that classes with more than one year group of pupils are smaller in Cyprus due to policy regulations (Ministry of Education 1993, Leontiou et al 1987) was identified by using the Kruskal Wallis one way analysis of variance across the randomly selected sample of teachers (K-W = 15.71 $p<.003$) and the sample of Cypriot beginning teachers (K-W = 24.88 $p<.001$). The representativeness of the sample of beginning teachers can be seen in terms of the fact that questionnaires were sent to its whole population and 82% replied.

Statistical Analysis and justification of tests used.

Both the hypothesis and the data of my research require not only the measurement of each variable for each group (Descriptive Statistical Analysis) but also to examine groups' and sub-groups' differences and relationships between variables (Inferential Statistics). As a consequence the data were coded according to Youngman's (1975, p. 19) suggestion into whole numbers and analysed using the SPSS-X programme. Having in mind the analytical procedures which can be used for the descriptive statistics (Youngman 1975, pp 53-61; Borg and Gall 1983, pp 363-370; and Fraas 1983) I decided to use percentages, mode, and medians to illustrate the dependent variables (Part B) which provide ordinal data (Items 13-30, 33-36). In addition, given the fact that Items 13, 14, 35 and 36 asked students to rank, it was appropriate to use the Kendall coefficient of concordance (W) which is illustrated and proved by Kendall (1970, pp 96-106).

Item 31 concerned with proportions of time spent on different classroom activities provides interval data since the categories are not only ordered but also equally spaced (Youngman 1979). As a consequence mean and standard deviation can be used to describe it. Finally items 32 and 37 provide nominal data since they can be differentiated only by type and no implicit relationship between the different categories related to them can be identified. Thus, percentages and mode can be used to describe them (Youngman 1984a, p. 58). In addition, bar-charts have been used to illustrate frequencies derived from ordinal data,

whereas histograms have been used for continuous data (Graham 1990, p. 23)

The analytical procedure which can be used for the inferential statistics is based on the choice of appropriate tests. Thus, the fact that a statistical test is a good one, if it has a small probability of rejecting H_0 when H_0 is true and a large probability of rejecting H_0 when H_0 is false, was taken into account. However, power is not the only criterion upon which the choice of the appropriate test should be based. The manner in which the sample of scores was drawn, the nature of population from which the sample was drawn and the kind of measurement or data must be also considered (Siegel 1956, p. 18). Nevertheless, the gathering of data from the *three different groups of the sample* implies that the choice of the appropriate test, should be focused on the kind of data with which the various comparisons will be associated. As a consequence, the following tests were used for comparisons between perceptions of two different groups: a) The t-test for item related to interval data (Items 31, 33, 34), b) The Kolmogorov-Smirnov two sample test for perceptions measured by ordinal data (Items 13-30, 36, 37), and c) The chi-square test for items measured by nominal data (32 and 37).

Comparisons among perceptions of more than two groups were concerned with the following three tests:

a) One way analysis of variance (ANOVA) to identify whether there is differentiation among perceptions of Items 31, 33 and 34. Youngman (1978, p. 11) indicates that this is the

"standard statistical method for assessing whether the variation between groups is substantially greater than that within groups";

b) The Kruskal-Wallis one way analysis of variance was used to examine the null hypothesis (H_0) related to perceptions of ordinal data (Items 13-30, 33-36) that the samples came from identical populations with respect to the mean (Siegel 1956, p.184). This test is more efficient than the extension of the median test because it utilizes more of the information converting the scores into ranks rather than simply dichotomizing them (Siegel 1956, Kruskal and Wallis 1952, Kruskal 1952). Finally, because the groups for comparisons (k) were more than 3 and the observations more than 5 the sampling distribution of KW was well approximated by the chi-square distribution with df = k-1 and its figures were used to identify statistical significance for KW values;

c) The chi-square test for k-independent samples was used for comparing perceptions of items 33 and 37 measured by nominal data.

Finally, the Spearman Correlation Coefficient (Freund and Walpole 1987, p. 546) was used to identify relations among perceptions of purposes of Mathematics and perceptions of methods of teaching and assessment in Mathematics. This was due to Coolican's (1990, p. 214) suggestion that data should be at, or converted to, ordinal level and should be in the form of related pairs in order to use this coefficient. On the other hand, the relations between perceptions of

influence on practice and classroom organisation were measured by the Pearson Correlation Coefficient.

Although statistical tests were used to identify statistical differences, there is a possibility of making either a Type I or a Type II error. To guard against this, I accepted: a) a level of significance of $p < .05$ in order to determine the Type I error; and b) I used the t-test, Kolmogorov-Smirnov two-sample test, and the Kruskal-Wallis one way analysis of variance which are high-power efficient tests to avoid Type II error.

3.2 Interview

Having decided that information should also be collected by interview, I had to take into account several elements for effective preparation. The first and most crucial element of that preparation concerned the function that the questioning was intended to do. Although I accepted Dexter's (1970) suggestion for having non-directive questions, I could not use only them since a comparison between quantitative and qualitative data was also needed. Hammersley and Atkinson's (1990, p. 114) observation that "interviewing in ethnography is by no means always non-directive" supported my decision to use both kinds of question. As a consequence, I created some guidance as to what to talk about (Appendix C.1) which I used during the interview, to ensure that I covered all those aspects.

The second element concerned the sampling technique which I had used. The interviewees were an opportunity sample of 10 first year teachers in Cyprus and 10 teachers of the five primary schools (Two from each school) who agreed to be interviewed. Since the purpose of the interview material was to complement and illuminate the sampled data of the questionnaires, the lack of randomness was not seen as serious. This was especially true given the small number of interviews that could be conducted.

Third, I decided that I should not use any superior to gain access to the interviewees, since I believed that the interviewee should be a willing participant. However, I used the following strategy to ease my access. My first contact with the interviewee was done face-to-face, where I explained to them that the research was about their perceptions and emphasised the value of their perceptions, in order to offer them more control over the interview and over the research generally. After that I assured them of confidentiality. Having in mind Powney and Watts' (1987) suggestion that I should give such guarantees, as I could at different stages of the research, I attempted to get them to agree to the conversation being tape-recorded, giving them the right to amend the transcript and control the tape. I also attempted to arrange at that time the place where the interview could take place. Rooms at interviwees' houses where no one could bias the informants' replies or distract the interviewees' attention were mainly used. Finally, I gave them in advance a letter identifying the topics to be discussed (Appendix C.2).

In the light of my experience from my initial contact with each interviewee, I attempted, at the first stage of the main interview, to develop an effective relationship with them. For this reason I attempted to be friendly, relaxed and pleasant at this stage. I also explained to them that I was very interested in their responses, since my research was attempting to reveal the value of their perceptions. Finally, I asked them whether they had any questions or concerns relating to the letter.

During the interview I attempted to show my interest without interrupting them and I did not show my agreement or disagreement with their perceptions, to show that there was no right or wrong answer. Whyte's (1982) suggestion that an interviewer should not give moral judgements and advice supports my approach. Nevertheless, sometimes, extra help was given for some of my specific questions when the interviewee found difficulty in answering.

Furthermore, I looked for their reactions to my questions, for signs of anything that appeared strange - and especially their voices. Relevant notes were taken during the interview, but I attempted to do that as quickly as possible since I wanted to give the impression to the interviewee that I was interested on his/her responses. At the end of the interview I asked them if they had any questions or if they wished to add any comment relevant to those which they had already made.

The final stage involved the transcribing of the interviews. Bell (1987) suggests that in general one should allow up to ten hours for one hour of interview. It is also the case that, in transcribing valuable information such as expression, tone and pacing of comment can easily be lost, and misinterpretation might occur (Conner 1991, p. 82). However, Hook (1985) argues that the use of sounds enables the listener to concentrate on the nature of the conversation, on the mode of expression adopted and the understanding of content or meaning that each individual demonstrates. As a consequence, I decided to follow a method of transcript similar to Hitchcock and Hughes' (1989 p.167) suggestion.

This method included the following stages. First of all, I put down my first reactions or feelings from each interview, related either to any methodological issue which was raised or with my consideration of their most important opinions. After that, I listened to the tape once through without attempting to write anything down. This provided me with a sense of the materials as a whole, the rhythm, tone and substantive content of the talk. I listened to the complete tape again putting down the most important points and finally transcribing the whole interview. Once a reasonable transcript had been made from the tape, I listened to the tape again as a whole, while going through my transcript and making any corrections, stopping the tape at the appropriate points to facilitate this. As a consequence an enormous amount of data was available for analysis.

However, I attempted to connect the data derived by each interview, with the specific issues raised by the questionnaire (Part B) and examine not simply whether teachers agreed with them, but to go beyond their perceptions in order to identify further issues. As a consequence, an analysis of each interviewee's perceptions about the purposes of teaching and assessment in Mathematics, the ways of teaching and assessment in Mathematics, the process of change and factors able to influence them with special reference to school policy for the teachers of these five schools was produced.

Having this analysis in mind I attempted to treat these materials in relation to the questionnaire. The match between the two methods was developed by coding the qualitative materials according to the demands of the questionnaire. The validity issue is discussed below (p.159)

Although the analysis of the qualitative data was focused on the issues raised by the questionnaire, it was not simply limited to them. Further issues were other teaching methods, professional dilemmas concerned with the current curriculum reform, and the implications of the highly centralised educational system. Interviews with teachers of the five schools were also focused on the effect of school policy on the process of change. Documentary research focused on the policy of these schools was also conducted to supplement the findings derived from the interviews.

After that, I prepared feed-back papers summarising the aspects of my research as related to the interviews. I did not find this very useful, since the interviewees were not able to find time to study those papers and therefore the discussions which followed did not lead to any substantial change.

4. METHODOLOGICAL ISSUES: LIMITATIONS AND ADVANTAGES

Although a lot is written on the limitations and strengths of the interview and questionnaire methods (see Tuckman 1972; Hopkins 1985, pp 68, 69, 74, 82, 83; and Walker 1985 pp 110-116), it is more useful to concentrate on issues to do with this particular research project. In this section I will examine methodological issues in the light of my research topics and design, concentrating on its validity, reliability and ethical implications.

4.1 Validity

The issue of validity, defined as the extent to which the instruments measure what they are intended to measure, and not something else (Weiss 1968, p. 11; Mueller et al 1977, p. 23), is a recognised problem in this kind of research. Another major question running through all this kind of interviewing and filling in of questionnaires is whether the informant is telling the truth, (Dean and Whyte 1969). It was possible that there were influences operating on informants, like the desire to please, (Whyte 1982). This is more possible when the views they wished to express are felt

to be out of line with current educational theory, (Denscombe 1984 p.115). For this reason, I emphasised that I was interested in how they saw teaching and assessment, rather than how they thought educationalists and policy-makers saw them. In addition, I emphasised that the purpose of this research was to capture teachers' perceptions since they are the professionals who have the "knowledge in action". Furthermore, following Selltiz et al (1981), I took the view that they had no reason to tell me lies:

> "It may be reasonable to assume that people will tell the truth about themselves unless we have specific reasons to think otherwise. The researchers ..... should identify particular, sensitive topics and try to take into account the sensitivity through proper interviewing techniques, question wording..." (p. 147).

Finally, I attempted, as I have already mentioned (p. 158), to check the interview data with the interviewees.

Another technique used in this research, related to validity, is the use of two methods of data collection. Lin (1976) believes that the use of contrasting methods reduces the chances that findings are artefacts of method. Furthermore, Boring (1953), Smith (1975) and Cohen and Manion (1989) consider triangulation as a way to increase validity. However, this increase should be seen within some limits, since it is possible that both methods could give invalid data (see Chapter 7).

4.2) Comparison of data

Comparison of quantitative and qualitative data raises the following methodological issues. It is first of all possible

that during the analysis of the qualitative data I was influenced by the findings of the quantitative data and either overemphasised some issues or did not take into account others. However, to limit bias, I used a pre-designed schedule to control the interview and the identification of themes emerging from it were analysed and compared with the questionnaire data. In addition, the analysis of qualitative data was carried out in advance of the quantitative data, in order to limit such influences.

Secondly, it is possible that interviewees may forget to mention something due to the fact that they did not have enough time to think about it. For this reason, I sent them the schedule to be used in advance (Appendix C.2) so that they had the opportunity to see the topics around which the interview was to take place and to think about the issues as they saw them.

Finally, there is a critical problem about how quantitative and qualitative data can be compared. The schedule of the interview provided a framework for comparison, but the framework itself was no guarantee of objectivity. The comparison of different kinds of data was still a matter of subjective interpretation. However to limit this subjectivity, in comparing the quantitative and qualitative data, I analysed perceptions of each interviewee about teaching and assessment in Mathematics, on his/her interview without having access to his/her own response to questionnaire. After that, I attempted to code his/her qualitative responses in terms of the demands of relevant

items of the questionnaire. At the final stage, I compared these codes with his/her actual responses to the questionnaire. Findings related to such comparisons are provided in Chapter 6 where quotations from interviews upon which codifications were based, are illustrated.

There is still the issue of whether his/her direct experience with one of the research instruments led them to respond similarly to the other. This implies that the fact that findings from two different methods are similar does not mean that both of them are valid. Therefore, I decided to conduct interview with the teachers, after he/she had completed the questionnaire, since the questionnaire method does not require a lot of direct contact between researcher and researched and limit the influences on his/her responses.

4.3) Reliability

An important criterion for judging any measurement is its reliability, which refers to the extent to which repeated measurement produces the same result. Estimates of reliability are, therefore, based on agreement or correlation between replications. Mueller et al (1977) suggest that a replication may be either the application of the same measurement to the same cases at different times (test-retest reliability) or the application of the same measurement to the same cases by different observers (inter-observer reliability), or the application to the same cases of nonidentical measures, which purport to measure the same

characteristics of those cases (split-half reliability or equivalent-test reliability). The test-retest reliability of this study can not be measured, since the resulting correlation may be affected by changes of perceptions. Thus, the reliability of this study was examined by the following two methods. First, the sample of this study was separated into two equal groups of Cypriot teachers chosen randomly and then a comparison of their responses to the questionnaire was attempted. No statistical significant difference was identified either among the two groups of the 10% group of Cypriot teachers or among the two groups of Cypriot teachers with one year of teaching experience. This means that the two groups were drawn from the same population.

Second, the reliability of the scales which measured the dependent variables was calculated by the Cronbach's Alpha. Cronbach's Alpha tells us how much correlation we expect between our scale and all other possible scales measuring the same thing by using the same number of items (SPSS Inc. 1985, B190).

Table 4.3, presented in the next page, shows that the values of Cronbach's Alpha for the four scales used to measure teachers' perceptions were high. Thus, the general picture from the split-half reliability test and the reliability of specific items looks internally strong. The strong reliability of the questionnaire data is finally discussed in Chapter 5 in terms of the match between evidence derived

from interrelated items and from comparisons of different sub-groups of teachers.

Table 4.3 : The values of Cronbach's Alpha for the four scales used to measure teachers' perceptions

No	Sample	Scale (Items)	N	Alpha Item	Standard. Alpha
1.	Cypriot beginn.	Levels of Confidence (Items 11 and 12)	2	.55	.56
2.	Cypriot Beginn.	Sources of Influences (Items 33 and 34)	12	.68	.68
3.	Cypriot Beginn.	Agreement with methods of teaching and ass/ment, and management of change (Items 15 - 30)	18	.56	.57
4.	General sample	Level of Confidence (Items 11 and 12)	2	.75	.75
5.	General sample	Sources of Influence (items 33 and 34)	12	.73	.74
6	General sample	Agreement with methods of teaching and ass/ment, and management of change (Items 15 - 30)	18	.57	.58

Technically the reliability of an interview would mean that if you carried it out on a separate occasion or if somebody else did the interview, it would produce the same results. Thus, reliability of the interview is very difficult to establish. It could be claimed that it is dependent upon my relationship with my informants, since this might affect their responses. For this reason, I attempted to create a relationship based on confidence and trust (Oakley 1981, Finch 1984).

However, even with a constant relationship of trust, different results are possible, because interviews are conducted in a human dimension and thus interviewees' feelings and/or relationship to interviewer, might change. In addition, because people respond to individuals differently, if somebody else did the interview she/he could get different results. Nevertheless methodological problems, related to the reliability of the interview method used in my research, are limited, due to the fact that the main purpose of the interview was to connect the evidence with the questionnaire responses which have themselves been proved to be reliable. Thus, the reliability of the interview method should be examined in terms of the fact that findings from the interview match findings derived from the questionnaire method, established as reliable.

4.4) Ethical issues

Burgess's (1989, p. 1) observation that "it is difficult for researchers to deny that ethical, moral and political questions do not (sic) surround their day-to-day experience of education and educational research" raising another methodological issue. In addition, Raffe et al (1989) argue that although survey researchers probably consciously confront ethical problems less frequently than most other educational researchers (Moser and Kalton 1971, Hoinville and Jowell 1978), surveys too have their ethical problems. Thus, ethical issues related to this study are not only linked to the use of interview method but also to the use of questionnaire.

As far as the rights of the respondents and their confidentiality, the research design and the use of codes was designed to protect them. Questions of sponsorship, widely debated in the literature, (Barnes 1979 and Bulmer 1982a), have nothing to do with my research. However there are two linked ethical issues. First participation should be by informed volunteers, and second, that the relationship between researcher and researched should be honest. Both issues have been taken into account, by providing advance information and by using only volunteers.

There is, however, another ethical issue related to this study, which has to do with the fact that anonymity could not be provided for the case of the 20 volunteers who gave me interview and replied also to my questionnaire. This is due to the intention of this research to compare the interview responses of each teacher with his/her own responses to the questionnaire, in order to evaluate the validity of the research. This issue was taken into account and interviewees were informed that I could identify their responses to the questionnaire, through the independent variables in the case of teachers of five schools and through code numbers in the case of beginning teachers. In addition, confidentiality was promised to be protected. With this background, they voluntarily agreed to give me the interview and allow me to treat the information, provided by them, in the light of the purposes of this study.

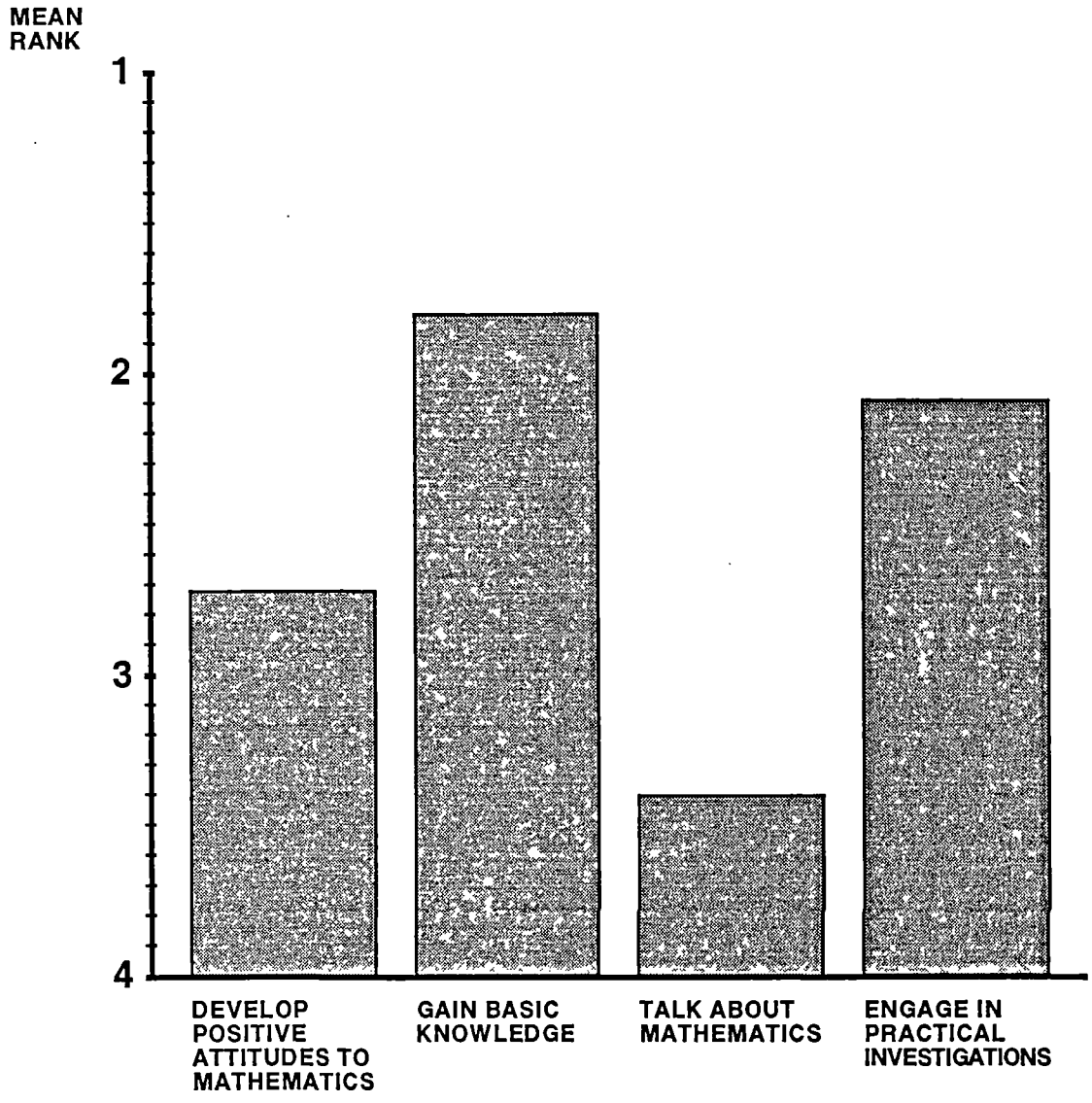
CHAPTER 5: REPORT AND ANALYSIS OF QUANTITATIVE DATA

This chapter is divided into two sections. The first one deals with the findings arising from questionnaires to the randomly selected sample of 10% of Cypriot teachers, and the second with comparisons of perceptions derived from the administration of this questionnaire to teachers of five primary schools in Cyprus, and to beginning teachers in Cyprus and England (see Chapter 4). The next chapter is concerned with the qualitative data of this study derived from interview with teachers of five primary schools in Cyprus and with Cypriot teachers who were at the end of their first year of teaching experience. Comparison between the quantitative and qualitative data is also attempted.

1) FINDINGS FROM QUESTIONNAIRE TO CYPRIOT TEACHERS

Policy on curriculum reform, as has been suggested in the third chapter, depends critically upon the perceptions of those who are responsible for implementing the curriculum. Thus, the perceptions of Cypriot teachers will be identified by analysing the data which arose from questionnaires administered to the 10% of the population of Cypriot teachers. The sample of the Cypriot teachers, as it has been argued in Chapter Four, is representative of the population of Cypriot teachers. The findings of the questionnaire to Cypriot teachers will be illustrated separately (Descriptive Statistics) in order to have a complete picture of Cypriot teachers' perceptions (Question 1). After that I will attempt to analyse further their responses in order to

GRAPH 1: CYPRIOT TEACHERS PERCEPTIONS ABOUT THE PURPOSES OF MATHEMATICS



identify correlations between their perceptions (Question 2). Finally, differences between the perceptions of groups of Cypriot teachers who differ from those of the rest will be explored in order to identify sources of differences among Cypriot teachers' perceptions (Question 3). The findings derived from the last part of this section will be examined further in the second section.

1.1 QUESTION 1: What were the perceptions of Cypriot teachers about issues of policy on Curriculum Reform in Mathematics?

a) Perceptions about aims.

a.1) Purposes of teaching Mathematics

There was very substantial agreement amongst Cypriot teachers in their perceptions of the purposes of teaching Mathematics. We can show this in Graph 1, given on the following page, in which the mean ranks of the perceived importance of each of four purposes are displayed. In the "Y" axis the mean ranks are given, having 1 as the highest point and 4 as the lowest. Since 1 represents the most important purpose for Question 13 of the questionnaire (Appendix B) then the height of the histogram shows how important each purpose is perceived to be. Kendall Coefficient of Concordance (W_1) was also calculated to identify the extent to which Cypriot teachers agreed among themselves in their ranking of the relative importance of the four purposes of Mathematics. This coefficient shows that there was highly significant agreement among Cypriot teachers' ranking of the purposes of teaching Mathematics (W_1=0.31, Z=2.194 V_1=3.989, V_2=714, $p<.001$) (Information

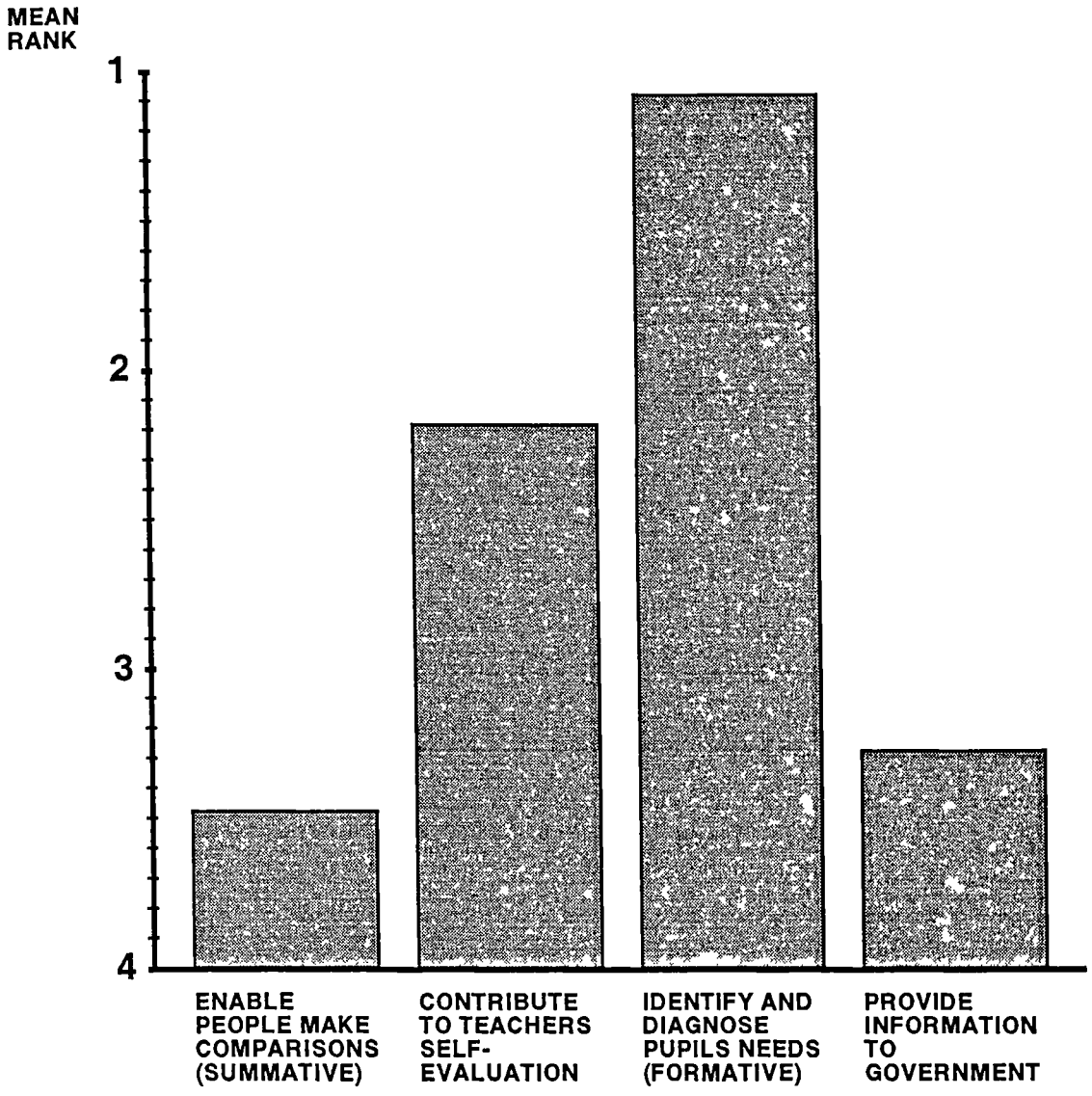
about the testing of the significance of this coefficient is presented in end note 1). It can therefore be inferred that Cypriot teachers agreed among themselves in their ranking of the relative importance of the four purposes of Mathematics.

Furthermore, Cypriot teachers gave high priority to purposes concerned with gaining Mathematical knowledge (Mean Rank = 1.80) and solving investigative tasks (Mean Rank = 2.09). These two purposes can be considered as equally important since their mean ranks are close to each other. The purpose which was ranked as the third most important concerned with the development of positive attitudes to Mathematics (Mean Rank = 2.71) whereas the one focused on pupils ability to talk about Mathematics was seen as the least important (Mean Rank = 3.40). This is supported by the fact that 60% of Cypriot teachers considered the latter purpose as the least important and 58% considered the purpose concerned with positive attitudes to Mathematics as neither the most important nor the next most important.

a.2) Purposes of Assessment

Graph 2, given on the next page, deals with perceptions of purposes of assessment and the statistical procedure used for its creation is similar to Graph 1. The same non-parametric test has been used for the analysis of the data. Thus, the testing of the significance of the Kendall coefficient of concordance for Cypriot teachers' perceptions about purposes of assessment (W_2 =.74, Z=6.233, V_1=3.989, V_2 =714, p<.001) was based on the same approximation (Fisher's Z-distribution) as in the above case, since the number of

GRAPH 2: CYPRIOT TEACHERS PERCEPTIONS ABOUT THE PURPOSES OF ASSESSMENT



entities is less than 7 (see end note 1). These coefficients show that Cypriot teachers agreed among themselves in their ranking of the relative importance of the purposes of assessment.

The following observations arise from Graph 2 (p. 169a). Formative assessment is considered as the most important by almost all the teachers. This can also be identified by the fact that 95% of teachers considered it as the most important purpose of assessment and almost all (98.9%) as either the most or the next most important purpose of assessment.

The next most important purpose of assessment is the teachers' self-evaluation which has a mean rank close to 2.00 (2.19) and 80% of teachers considered it as the second most important purpose. Since teachers' self-evaluation and formative assessment have direct feedback into the teachers' own teaching, it can be inferred that Cypriot teachers considered assessment as a means of providing information to help teachers make decisions about their teaching. It is also of interest to emphasise the low rating given to summative purposes of assessment (mean rank=3.47) and to the national monitoring (mean rank=3.27). Their mean ranks are not only very close to each other but also close to 3.50 which means that they are clearly differentiated from the other two purposes. As far as the summative purpose is concerned, only one teacher (0.6%) considered it as the most important purpose, whereas 95% saw it as either the least or the next least important purpose. Similarly, only two

teachers (1.1%) considered national monitoring as the most important purpose and 87% saw it as either the least or the next least important purpose. It can be therefore claimed that summative purposes and national monitoring were considered as the least important purposes of assessment.

b.1) Perceptions about the implementation of Curriculum Policy

The figures in Table 5.1 are based on the information derived from teachers' response to Items 15 to 30 of the questionnaire (Appendix 'B'). All these items are concerned with the implementation of policy on Mathematics pedagogy (Part A), assessment in Mathematics (Part B), and assumptions about the process of change (Part C). Teachers were asked to express their agreement or disagreement with these items. Thus, these data constitute an ordinal scale, since although there is a relation which implies an order of acceptance of these methods, there is no obvious way of checking that the points in the scale are equally spaced {isomorphic to the structure of arithmetic (Youngman 1979, pp 7-8)}. Accordingly, percentages of teachers agreeing and disagreeing with ways of teaching and assessment in Mathematics and management of change, and medians, modes and minimum-maximum values are shown in the Table 5.1 in the following page (p. 171a).

Mathematics Pedagogy

The following observations concerned with perceptions of Mathematics pedagogy arise from Table 5.1. First, the great majority of Cypriot teachers (more than 65%) agreed with Items A.2, A.3, A.4, A.6, and A.7. Beside this, modes and

Table 5.1: Percentages of Cypriot teachers who agree and those who disagree with the following methods of teaching and assessment in Mathematics and ways of management of change, and their medians, modes and maximum and minimum values

No.	Methods of Teaching and asessment and mangement of change	% Cypriot teachers who Disagree*	Agree**	median	mode	Minim.-Maxim.
A)	MATHEMATICS PEDAGOGY					
1	Fixed sequence of topics	14.8	76.0	4.00***	4.00	1.00-5.00
2	Practical activities as appropriate for Key Stage 2 as for Key Stage 1 pupils	9.7	77.9	4.00	5.00	1.00-5.00
3	Practical activities as appropriate for high attaining pupils as for low	17.9	68.5	4.00	4.00	1.00-5.00
4	Needs for talk in each activity	4.4	86.9	4.00	4.00	2.00-5.00
5	Fixed time for teaching Mathematics	55.8	20.5	2.00	2.00	1.00-5.00
6	Using Mathematics in a wide range of contexts throughout the curriculum	3.9	83.8	4.00	4.00	1.00-5.00
7	Mathematics should be taught mainly through investigations	17.5	65.0	4.00	4.00	2.00-5.00
B)	ISSUES OF ASSESSMENT POLICY					
1	Assessment as natural part of teaching	0.5	98.4	5.00	5.00	1.00-5.00
2	Assessment on the basis of products than process	52.7	25.7	2.00	2.00	1.00-5.00
3	Assessment of pupils' attitudes	23.2	54.7	4.00	4.00	1.00-5.00
4	Assessment of child's ability to apply Mathematics in unfaminliar situations	10.9	78.3	4.00	4.00	1.00-5.00

No.	Methods of Teaching and asessment and mangement of change	% Cypriot teachers who Disagree*	Agree**	median	mode	Maxim.-Minim.
C)	**ISSUES RELATED TO MANAGEMENT OF CHANGE**					
1	Whole school decision-making about methods of teaching and assessment	21.1	57.3	4.00	4.00	1.00-5.00
2	Having the National Curriculum in Mathematics is useful for:					
	a) planning my teaching	2.7	93.0	4.00	4.00	2.00-5.00
	b) carrying out my teaching	28.0	49.4	3.00	4.00	1.00-5.00
	c) assessing children's learning	27.1	57.2	4.00	4.00	1.00-5.00
3	Teachers' perceptions should be taken into account	4.3	87.6	4.00	5.00	2.00-5.00
4	INSET in Mathematics should be about problems of curriculum practice	19.1	69.9	4.00	4.00	1.00-5.00
5	Manageable requirements of curriculum policy in Mathematics for my class	53.3	27.2	2.00	2.00	1.00-5.00

* = This group of teachers either disagree or absolutely disagree
** = This group of teachers either agree or absolutely agree
*** = 1: I absolutely disagree; 2: I disagree; 3: do not know/I cannot say; 4: I agree; 5: I absolutely agree

medians of these items are 4.00 (numbers which represent agreement). Furthermore, Items A.4, and A.6 were accepted by an extremely high percentage of teachers (more than 80%) and illustrate a broad consensus among Cypriot teachers. It can be, therefore, claimed that Cypriot teachers agreed with active learning in Mathematics through practical and investigative tasks which are appropriate for children irrespective of their age or ability. They also gave high attention to the fact that children should be able to present their results to their classmates. Finally, they believed that there is a fixed sequence of Mathematical topics for children to follow.

My second observation has to do with Item A.5 which was rejected by more than half of Cypriot teachers and both its median and mode is 2.00. Although it could be asserted that the majority of Cypriot teachers disagreed with this item, the fact that the percentage of teachers who neither agreed nor disagreed with it is almost equal to 25% and those who disagreed are equal to 20% shows that there was a variation among teachers' opinions. It is therefore obvious that rejection of a fixed time for teaching Mathematics can not be seen as a representative opinion of the whole group of Cypriot teachers.

Assessment Policy

The second part of Table 5.1 is concerned with issues of assessment policy in Mathematics. We can first of all observe that the great majority (more than 75%) of Cypriot teachers agreed with Items B.1 and B.4. Beside, only one

teacher disagreed with item B.1, which was accepted by almost all the Cypriot teachers. Moreover, the value of its median and mode is 5.00. This implies that more than 50% of Cypriot teachers did not simply agree but absolutely agreed with the opinion that assessment should be a natural part of teaching. The only teacher who disagreed with that item is the same one who considered summative assessment as the most important purpose of assessment (see p.169).

Second, Items B.2 and B.3 displayed different patterns. Item B.2 was accepted by half of Cypriot teachers but rejected by a quarter of them. On the other hand, Item B.3 was rejected by half of Cypriot teachers but accepted by a quarter of them. These figures suggest that there was a variation in teachers' perceptions of these two items. It cannot be, therefore, claimed that Cypriot teachers, as a group, rejected the idea that assessment should be based on pupils' outcomes rather than process or that they agreed with assessment of pupils' attitudes to Mathematics.

However, we can observe that for most of the items concerned with issues of both Mathematics pedagogy and assessment policy (8 out of 11) there was a very substantial agreement among Cypriot teachers. It can be claimed that they had a coherent view about these items. Beside, although there was variation in teachers' opinions about the other three items, the fact that more than half of them adopted the same opinion about these items implies that there was consensus among teachers' opinions about methods of teaching and assessment in Mathematics. This was further explored by

using the "SELECT" procedure of the SPSSX program (SPSS Inc. 1990) and identifying that 40% of Cypriot teachers agreed with all of the 5 items supported by the majority of Cypriot teachers dealing with Mathematics pedagogy (Items A.2, 3, 4, 6, and 7) whereas all of them agreed with at least one of these items. This assumption is further analysed in Section 1.2 where correlations among teachers' perceptions about these items are presented and the assumption that Cypriot teachers supported the "active" pedagogy is explored.

The last issue concerned with assessment policy has to do with pupils' self-assessment which is emphasised by policy documents. The item 37 concerned with teachers' perceptions about pupils' self-assessment did not measure teachers' agreement with this assessment method but whether or not they thought that their pupils knew enough Mathematics to assess themselves. This is due to the fact that the appropriateness of this method has mainly to do with whether it can give valid results. Thus, data derived from item 37 can be considered as categorical data.

During the pilot study of the questionnaire it was found out that teachers were not able to answer this item easily (Chapter 4). It was therefore decided that teachers could respond to this item by either indicating that they thought that their pupils were able to assess themselves, or that they thought that their pupils were not able, or that they did not know whether or not they were able to do it. The distribution of their responses to this item shows that 43% believed that their pupils were able to assess themselves

and 22% that their pupils were not able to do it. However, a relatively high percentage of teachers (35%) was not sure whether their pupils could assess themselves. The figures derived from this item reaffirm the findings of the pilot study of the questionnaire and show how crucial this issue is. In addition, there was a very big variation among teachers' responses which is different from the finding derived from Table 5.1 suggesting that Cypriot teachers had a coherent view about methods of teaching and assessment in Mathematics.

It can be, however, claimed that this finding might have arisen because there was a big variation among pupils' abilities in Mathematics which affected teachers' responses (see p. 232). Nevertheless, there is no research on pupils' abilities in Mathematics either to support or negate this assumption. In addition, comparison of the responses among teachers who teach high attaining pupils in Mathematics with those who teach low attainers was not possible. On the other hand, this finding might be attributed to the fact that teachers did not assess pupils' abilities in Mathematics systematically and thereby they were not able to answer this question. This assumption might provide explanations for the high percentage of teachers who were not sure whether pupils are able to assess themselves. In supporting this argument, it is worth mentioning that there is no systematic assessment policy in Cyprus (see Chapter 3) and this might affect practice. However, the lack of research evidence on teachers' assessment in Cyprus does not help us to clarify further this assumption.

Management of Change

The last part of Table 5.1 illustrates teachers' agreement with assumptions about the process of change. The following four observations arise from this table. First, Items C.2a, C.3, and C.4 were accepted by more than two thirds of Cypriot teachers. Beside this, modes and medians are 4.00 representing agreement. Furthermore, Items C.2a and C.3 were accepted by an extremely high percentage of teachers (more than 85%) which illustrates a broad consensus among Cypriot teachers similar to that identified in Parts A and B of this table.

Second, Items C.1, C.2c and C.7 were accepted by half of Cypriot teachers and their median and mode are 4.00. However, more than 20% of Cypriot teachers disagreed with these items. Their opinions were, therefore, varied. Furthermore, Items C.2c and C.7 were rejected by almost 30% of Cypriot teachers. It can be, therefore, inferred that these three items were accepted by half of Cypriot teachers though a relatively high percentage of Cypriot teachers disagreed with them.

Third, Item C.2b is the only one with its median equal to 3.00. In addition, less than half of Cypriot teachers agreed with it whereas almost 30% disagreed with it. Finally, 20% of teachers expressed no opinion. The figures derived from this item suggests little overall consensus on whether teachers use the New Curriculum of Cyprus for carrying out their teaching in Mathematics.

We can finally observe that teachers' responses on items C.2a, C.2b and C.2c concerned with the use of the New Curriculum for planning, carrying out and assessing in Mathematics respectively reveal that not as many teachers agreed that the New Curriculum is useful for carrying out and assessing their Mathematics lessons as those who agreed that it is useful for planning. It can be therefore argued that Cypriot teachers, as a group, did not find the New Curriculum so helpful for assessing or carrying out their Mathematics lesson as for planning. This difference can be attributed as much as to the fact that teachers are required to teach a specific Mathematical content defined by the New Curriculum and thus they have to plan their teaching according to that content (long-term planning) as to the fact that the New Curriculum does not provide specific suggestions for teaching each topic of the Mathematics curriculum and thus it is not very useful for carrying out or assessing their daily lessons.

However, the findings concerned with the use of the New Curriculum for teachers' planning were further investigated by Item 32 of the questionnaire (Appendix B). This item asked teachers to indicate which of the following they use most frequently for planning: a) New Curriculum, b) Policy Guidance (BODAPE), c) Textbooks and d) other. Table D.3 of Appendix D shows that only 1.5% of Cypriot teachers used any document other than the above three for their planning. Thus, this item seems to have a high value of content validity (Nuttall 1989, Angoff 1986). As far as their preferences among these three documents, 57% of teachers

used textbooks and only 20% used the New Curriculum. This finding shows that even if teachers agreed that the New Curriculum was useful for planning, their planning was mainly influenced by the national prescribed textbooks rather than the New Curriculum.

Techniques of Assessment (Appropriateness and Ease)

Item 35 of the questionnaire (Appendix B) was used to find out how important and how easy each technique of assessment was considered by Cypriot teachers. Thus, data derived from this item have to do with the implementation of assessment policy. Teachers were asked to rank twice eight techniques of assessment in Mathematics (Duncan and Dunn 1990). They had to rank them according to their appropriateness (Column A) and their ease (Column B). As a consequence, the data derived from this question were analysed similarly to those concerned with teachers' ranking of purposes of Mathematics (Section 1.a) and purposes of assessment (Section 1.b). Therefore, the mean ranks and the Kendall Coefficient of Concordance have been calculated by Kendall's non-parametric test and are presented in the third and fifth columns of Table 5.2. The Kendall non-parametric test has been used to identify whether there was agreement among Cypriot teachers' ranking for the appropriateness of techniques of assessment and whether there was such agreement among Cypriot teachers' ranking for the ease of these techniques. It is important to indicate that since the number of entities to be ranked is larger than 7 (techniques of assessment are 8), the significance of the value of 'W' can be tested by using the following formula which is approximately distributed as chi-

square with df=n-1 and $X^2=(12S)/[mn(n+1)]$ where n is the number of ranks and m is the number of ranking (Siegel 1956, p. 236).

In addition, columns 4 and 6 of Table 5.2 show the 'absolute rank' of the mean ranks which is constructed by ordering the mean ranks. The "absolute ranks" are used only for display purposes, and their representation does not necessarily imply an ordering of the perceived appropriateness and ease of these eight techniques of assessment.

Table 5.2 does not only include the eight techniques of assessment but also two broad categories created on the basis of them, namely written and oral techniques. The category of written techniques represents an average of the methods which have to do with a written test (1, 3, 5, and 8) and the oral category represents the rest of the techniques. The Kendall non-parametric test has been also used to identify whether teachers' responses provided similar rankings for these two different categories of techniques of assessment. However, since the number of entities to be ranked is smaller than 7, the coefficients of concordance of the teachers' ranking of the two broad categories have been tested using the approximation presented at end note 1. Therefore the values of 'W' and either `$X^2$` or Z, V_1 and V_2 as relevant for each test are presented in Table 5.2.

Table 5.2: Mean ranks and 'absolute' ranks of assessment methods according to perceptions of appropriateness and ease

No.	Methods	Appropriateness		Ease	
		Mean Rank	Absolute Rank	Mean Rank	Absolute Rank
1	Multiple choice and matching questions	4.44 *	5	5.09 **	5
2	Unstructured observation	6.05	8	3.31	2
3	Sentence completion	5.34	7	4.22	4
4	Oral question-and-answer	4.01	3	2.38	1
5	Extended written question	4.41	4	5.87	7
6	Structured observation	3.29	1	5.28	6
7	Interview	3.52	2	5.98	8
8	Direct written question	4.49	6	3.87	3
Coefficients		W=0.18 - X^2=218.20 df = 7, p<.01		W=0.27-X^2=323.19 df = 7, p<.01	
Combinations					
1	Oral techniques ***	1.35	1	1.42	1
2	Written techniques ****	1.65	2	1.59	2
Coefficients		W=0.10 Z=1.3527 V_1=0.99 - v^2=174 p<.01		W=0.04 Z=0.8425 V_1=0.99 - V_2=167 p<.05	

* 1 = Most Appropriate 8 = Least Appropriate
** 1 = Most Easy 8 = Least Easy
*** Oral techniques = Combination of techniques 2, 4, 6, and 7
**** Written techniques = Combination of techniques 1, 3, 5 and 8

It emerges clearly from the coefficients presented in this table that Cypriot teachers agreed among themselves in their ranking of the relative appropriateness of each technique and also agreed among themselves in their ranking of the relative ease of each technique. However, the mean ranks tend to cluster close to each other, with small differences between them showing that no one method was regarded as clearly the most or least appropriate or most or least easy.

Nevertheless, the mean ranks suggest that techniques of assessment can be classified into the following groups according to their perceived appropriateness. First structured observation and interview were considered as the most appropriate methods since their mean ranks are the smallest and very close to each other. The oral question-and-answer with mean rank 4.00 is the method which was considered as the next most appropriate since the difference of its mean rank from the next larger (4.41) and next smaller (3.52) is up to 0.40. Third, methods in the middle are the extended written questions, multiple choice questions and direct written questions which have mean ranks very close to 4.5 and differences between them are only up to 0.05. All of them are written techniques having similar characteristics. Fourth, although sentence completion is a written technique, its mean rank (5.34) is clearly differentiated from the group of other written techniques. However, its mean rank is also differentiated from that of unstructured observation (6.05) and it can be inferred that unstructured observation was seen as the least appropriate

technique and sentence completion as the next least appropriate.

We can now analyse further the features of the third column of this table by exploring the figures at the bottom part of the table. This part has the eight methods collapsed into two categories, namely oral and written techniques, and treated statistically in their two categories. The value of Z suggests that the relevant value of W indicates statistically significant agreement among teachers' ranking of the relative appropriateness of these two categories. This agreement is shown by the fact that three of the oral methods were considered as the three most appropriate techniques. However, unstructured observation was considered as the least appropriate technique and this raises a question about whether the oral category was a coherent one on Cypriot teachers' perceptions. On the other hand, the mean ranks of written techniques were very close and the absolute values of the mean ranks were 4, 5, 6 and 7 suggesting that the category of written techniques was a coherent one and considered as less appropriate than structured observation, interview and oral question-and-answer but not unstructured observation. It can be therefore argued that the three oral techniques which were considered as the most appropriate are those which are more formally structured.

The distribution of the mean ranks of ease of application of the same methods, is also shown in this table. The value of W indicates a very substantial agreement among teachers on

the way in which they ranked the ease of these techniques. Furthermore, the first four mean ranks are clearly differentiated from each other and we can claim that the "absolute rank" is a meaningful indication of the extent to which each technique was considered as easy. Thus, oral question-and-answer was considered as the most easy technique and unstructured observation as the next most easy. Methods in the middle are the direct written questions and the sentence completion since their mean ranks are close to 4 and their "absolute ranks" suggest that they were considered as neither among the most easy nor among the least easy.

The other four techniques have almost the same mean rank (range smaller than 1.00). The last finding might suggest that teachers believed that all these methods can be considered as equally difficult. However, against this, it is important to mention that the mean ranks of interview and extended written question (5.98 and 5.87 respectively), are relatively large and can be considered as the least easy techniques.

As far as the bottom part of the table is concerned, although the value of Z is relatively small it does indicate agreement among Cypriot teachers' ranking of the relative ease of oral and written techniques. However, the statistically significant agreement among Cypriot teachers' rankings of the relative ease of these two categories is accepted at 0.05 level but not at 0.01 level. Nevertheless, the small value of Z may not be explained as meaning that

teachers' rankings were dissimilar but because of the way these two categories have been constructed. This can be explored by looking at the "absolute ranks" of the techniques of each category. For the written methods these values were 3, 4, 5 and 7 whereas for the "oral" they were 1, 2, 6, and 8. This seems to suggest that the second category consisted of the most easy and the least easy techniques. Although tentatively we can ignore this significant difference, if we link this finding with that concerning the "absolute ranks" of the appropriateness of "oral" techniques we can claim that this category was not a coherent one in Cypriot teachers' perceptions.

The last, and probably the most important finding, has to do with the well known dilemma that what is easily measured is of dubious educational value. Interview and structured observation were considered as the most appropriate but the least easy techniques. Likewise, the direct written question, and the unstructured observation were regarded as one of the most easy but least appropriate. However, the oral question-and-answer was the technique seen as the third most appropriate and as the most easy method. It might be therefore expected that this is the technique which Cypriot teachers use often for assessment in Mathematics.

This negative relation between the perceived importance and perceived ease of each technique was further examined by looking at the relations of the "absolute ranks". Despite problems of methodology, I attempted to make a comparison among the "absolute ranks" of 'appropriateness' and 'ease'

for each technique for display purposes only. This is provided in Graph 3, given in the following page (p. 185a), where each of the eight methods is represented with a point indicating the "absolute rank" of its 'appropriateness' set against 'ease'.

It can be seen that, with one exception, there is a negative correlation between the appropriateness and ease of techniques of assessment. The exception is oral question-and-answer. Using the method of least square and excluding the exception, a line was drawn and its correlation coefficient was computed. This correlation coefficient (-0.71) reveals a very strong negative relationship between the appropriateness and ease of each technique of assessment. Therefore, there is a very strong consensus among Cypriot teachers that the least appropriate techniques are the easiest to implement.

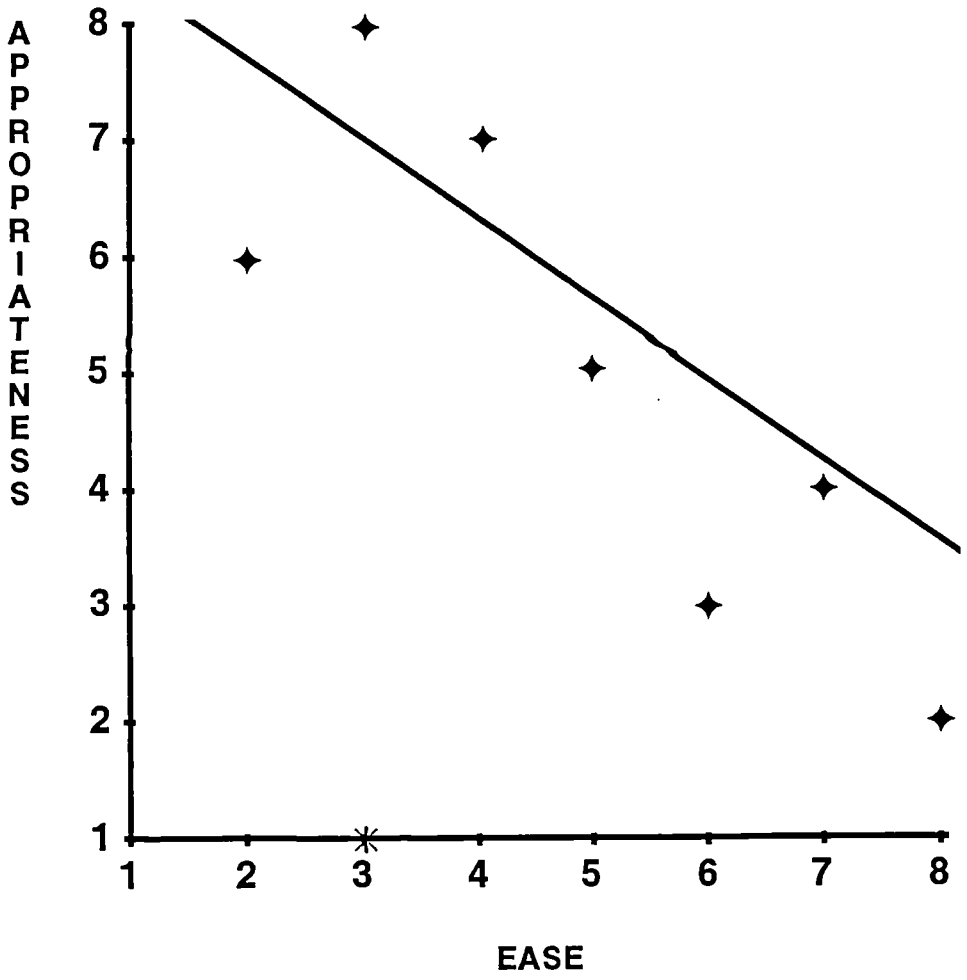
Given this correlation our interest should be on those techniques which are the most appropriate and the least easy and their points should lie up near the 'y' axis. Structured observation and interview are these techniques. It might be claimed that there is a need for in-service training concentrating on these techniques since Cypriot teachers considered them as appropriate but difficult. This assumption is analysed below (Section d) where teachers' perceptions about ways of improving assessment in Mathematics are illustrated.

b.2) Perceptions about the implementation of Curriculum policy: Classroom Organisation

This part is concerned with the implementation of curriculum policy at classroom level and especially with how Cypriot teachers organised their classroom. The reasons for dealing with how teachers organised their classroom rather than how they thought that a Mathematics classroom should be organised had to do with both findings from unstructured interview (Appendix G) and with the policy requirements that the time for teaching Mathematics should be distributed equally in working as a whole class, individual tasks and collaborative tasks (pp 31-32). Cypriot policy documents referred to this as "balance". Although such a consideration of balance is problematic (Alexander et al 1992), Item 31 of the questionnaire asked teachers to estimate the proportions of time in Mathematics lessons that their pupils spent in working on individual tasks, on collaborative group tasks and as a whole class and hence teachers' responses to this item provided interval data. However, standard deviations derived from Cypriot teachers' responses to these three ways of classroom organisation revealed that there was not as much consensus among their responses to this question as about perceptions of implementation of curriculum policy. Thus, I decided to use Cluster analysis to identify relatively homogeneous groups among Cypriot teachers based on the way they organised their Mathematics classroom.

Table D.4 of Appendix D presents the Agglomeration Schedule which summarizes the results of Ward's Clustering method (End note 2). The fourth column illustrates the squared Euclidean distances between the two most dissimilar points

GRAPH 3: CORRELATION BETWEEN APPROPRIATENESS AND EASE OF TECHNIQUES OF ASSESSMENT ACCORDING TO CYPRIOT TEACHERS



✳ Excluded (Oral question and answer)

of the clusters being combined in each stage. These coefficients were therefore used for guidance in deciding how many clusters are needed to represent my data. Since small coefficients indicate that fairly homogeneous clusters are being merged, I decided to stop agglomeration as soon as the increase between two adjacent steps become large (SPSS Inc. 1985, p.174; Romesburg 1984, p.215). In Table D.4 there is a fairly large increase in the value of the distance measured from a six-cluster (5.55) to a five-cluster solution (8.59) (ie Stages 8 and 7). The six-cluster solution is, therefore, preferred.

Similar findings can be identified by looking at the dendrogram produced by Ward's Clustering method, presented in Appendix D (Figure D.1), which is another way of visually representing the steps in a hierarchical clustering solution. However, Figure D.1 illustrates the dendrogram produced by "SPSSX cluster procedure" and does not plot actual distances but rescales them to numbers between 0 and 25 (SPSS Inc. 1985, p.175). Nevertheless, it can be used to identify the stage at which clustering should stop by looking at the distances at which clusters are combined. We can therefore observe that the six-cluster solution is easily interpretable and occurs before the distance at which clusters are combined becomes too large. This finding is in line with that derived from Table D.4 and again justifies the six-cluster solution.

We can now turn to the figures of Table 5.3 which presents means, medians, modes, and standard deviations derived from

responses of these six homogeneous groups of Cypriot teachers. Figures concerned with responses of the whole group of Cypriot teachers on this item are also illustrated. The following observations arise from this table. First, the relatively very small values of standard deviations of the six cluster-groups compared with that of the whole group of Cypriot teachers, and the fact that the values of means, medians, and modes of these six groups about each item are very close suggest that homogeneous groups of teachers have been identified by the six-cluster solution and justifies this solution.

Second, most teachers (91%) organised their Mathematics lessons in such a way that children spent more than 50% of their time in working as a whole class. This is revealed by the fact that pupils of teachers who are members of most of the clusters (4 out of 6) spent most of their time in working as a class. There are only nine teachers (Type III, 4.9% of Cypriot teachers) who organised their class in such a way that pupils spent more than 50% of their time working on individual tasks and not as a whole class, whereas pupils of all the other teachers did not spend more than 30% of their time on individual tasks. There are, finally, eight teachers (Type VI 4.3%) who organised their class so that pupils spent more than 50% of their time in working on collaborative group tasks and only 20% as a whole class.

Third, there is no group of teachers which organised their Mathematical lessons in order to distribute their time equally between working as a class, working on individual

Table 5.3 Means, Medians, Modes, and Standard Deviations of time in Mathematics lessons that the children of six cluster groups of Cypriot teachers and of the Whole Group of Cypriot teachers spent in working on individual tasks, on collaborative group tasks, and as a whole class.

Group of Teachers (Number)	Working as a Whole Class				Collaborative Tasks				Individual Tasks			
	Mean	Median	Mode	S.D.	Mean	Median	Mode	S.D.	Mean	Median	Mode	S.D.
Type I (N=38)	83.45	80.00	80.00	6.30	9.37	10.00	10.00	5.55	7.13	10.00	10.00	3.91
Type II (N=51)	48.00	50.00	50.00	4.01	31.29	30.00	30.00	6.11	20.	20.00	20.00	6.07
Type III (N= 9)	21.00	20.00	20.00	6.00	22.78	25.00	25.00	6.67	56.11	50.00	50.00	7.82
Type IV (N=42)	66.78	70.00	70.00	5.61	24.76	22.50	20.00	8.18	9.88	10.00	10.00	2.81
Type V (N=34)	60.50	60.00	60.00	9.09	14.65	16.50	20.00	6.72	26.03	20.00	20.00	8.54
Type VI (N= 8)	21.00	22.50	25.00	4.43	58.75	60.00	50.00	9.54	20.00	17.50	10.00	9.26
Whole Group (N=182)	59.04	60.00	50.00	19.17	22.96	20.00	30.00	13.52	18.30	15.00	10.00	13.94

tasks and working on collaborative group tasks. The only group which was close to such equal distribution of their teaching time is the second one. However, these 51 teachers organised their classes in such a way that pupils spent 50% of their time in working as a whole class whereas the other 50% were not equally distributed to collaborative tasks and individual tasks. This finding was explored further by using the "Select" command and chosing from the whole sample of Cypriot teachers those who responded to item 31 by indicating that their pupils spent more than 19% and less than 41% of their time in each of the three ways of classroom organisation. I found out that pupils of none of those teachers spent less than 40% in working as a whole class and by using the "crosstabs" command (SPSS 1983, 1990) the responses of each teacher to the other two ways of classroom organisation were examined. Thus, I found that there were only three teachers who organised their classes so that the proportions of time spent in these three kind of tasks were roughly the same. One of them organised her class in such a way that 30% of teaching time was spend in working on individual tasks, 30% on collaborative tasks and 40% as a whole class whereas the other two organised their classes so that pupils spent 25% in working on individual tasks, 35% on collaborative tasks and 40% in working as a whole class.

Fourth, their teaching time was not equally distributed even between working on individual tasks and working on collaborative group tasks. Although the means derived from the responses of the whole group of teachers could suggest that, the only group of teachers who organised their classes

in order to spend the same amount of time in working on individual tasks with those in working on group tasks is the first one (N=38). It is, however, important to indicate that pupils of this group spent less than 10% in working on individual tasks and less than 10% in working on collaborative group tasks.

We can now describe each group of the six-cluster solution on the basis of their responses to this item. Teachers of the first group (N=38) are those who spent most of their time in working as a class (80%) and the rest of the time was equally distributed to individual and collaborative tasks. However their pupils were very rarely involved with either collaborative or individual tasks. Their practice was mainly based on a teacher-centred approach to teaching Mathematics. They can be called as the "whole class instructors".

Teachers of the fourth and fifth groups were also "whole class instructors", although they organised their classes in such a way that their pupils were working as a whole class for more than 60% of their time. However, pupils of the fourth group had also the opportunity to work on collaborative tasks (25%) and pupils of the fifth group spent 30% of their time in working on individual tasks. Thus, teachers of the fourth and fifth groups organised their classes in such a way that their pupils did not spend more than 15% of their time in working on individual and collaborative tasks, respectively.

The second group of teachers organised their classes in such a way that their pupils spent less time in working as a whole class than pupils of the above three groups since they did not spend more than 50% of their time in working as a whole class. This is the only group of Cypriot teachers who organised their classes close to the suggestions of the policy documents emphasising the importance of distributing their time equally to the three ways of classroom organisation.

The third and the sixth groups are those which are consisted of the few Cypriot teachers who did not spend most of their time in working as a whole class. The third group of teachers (N=9) based their teaching in Mathematics on individual tasks (50-63%) and the rest of their pupils' time was equally distributed to collaborative tasks and whole class tasks. These teachers can be called as the "individualisers". On the other hand, teachers of the sixth group (N=8) organised their teaching Mathematics in such a way that pupils were mainly involved with collaborative tasks (50-67%) and the rest of their time was equally distributed to whole class and individual tasks. We can call them "group workers".

c) Influences on practice.

Questions 33 and 34 were concerned with the perceived extent to which six sources of influence (head, colleagues, parents, inspectors, pupils and policy documents) affected classroom practice of Cypriot teachers and the extent to which teachers wanted each of these items to influence their

classroom practice. The data derived from these questions do not really constitute an interval scale, since although there is a relation which implies an order of influence from each item, there is no obvious way of checking that the points in the scale are equally spaced (ie isomorphic to the structure of arithmetic).

However, I decided to treat teachers' responses as constituting an interval scale, because the distribution of the teachers' responses for most of the items (8 out of 12) was similar to the normal distribution. This can be mainly identified by the distribution of the number of teachers who used each number of the scale. It can be also partly examined by comparing the median and the mean of the response on each item since for a normal distribution these two numbers should be very close. Tables D.5 and D.6 of Appendix D indicate those items in which Cypriot teachers' responses were similar to the normal distribution. However, for those three items where there was a very substantial agreement among Cypriot teachers, it is difficult to infer a normal distribution or any other distribution. This is because a more detailed scaling, with a wider range, might have led to a different distribution of responses than was the case with the existing scale. (These items are signified by the use of N.A. in the 5th column of Tables D.5 and D.6).

My decision was also influenced by the fact that this consideration enables me to use the factor analysis in order to summarize these six items into a smaller number of "derived" variables. Moreover, it enables me to use the t-

test which is a powerful test for the examination of differences between two means, for the identification of statistically significant differences between the perceptions of various groups of teachers (see Sections 1.3 and 2). Finally, this consideration enables me to use the mean and standard deviation to describe teachers' responses to those items. Accordingly, means, and standard deviations of the extent to which these six items influenced the classroom practice of the whole group of Cypriot teachers and those of the six groups of Cypriot teachers derived from Cluster Analysis are shown in Table 5.4 (p. 193a). Cluster Analysis, described above, was used to identify relatively homogeneous groups of Cypriot teachers according to their perceptions about items which influenced their practice. I chose the six-cluster solution since the Agglomeration schedule shows a fairly large increase in the value of the distance measure from a six-cluster to a five-cluster solution (Table D.7). Similar findings came from the dendrogram produced by SPSSX which is presented in Figure D.2 (Appendix D) since the six-cluster solution occurs before the distance at which clusters are combined become too large.

Influences on classroom practice (reality)

The following four observations arise from Table 5.4. First, the strongest influence on classroom practice was that of official documents about the curriculum according to responses of the whole group of Cypriot teachers and those of teachers of four out of six clusters. This finding can be attributed to the high extent to which the centre can

Table 5.4 Means and Standard Deviations of the extent to which the following factors influence the classroom practice of Cypriot teachers and the practice of six groups produced by the Cluster Analysis.

Group of Teachers (Number)	Teachers		Head		Pupils		Parents		Inspector		Curric. Docum	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Type I (N=69)	3.29*	0.66	3.62	0.59	3.68	0.81	2.32	0.85	4.01	0.65	4.27	0.54
Type II (N=33)	3.00	0.50	2.79	0.74	2.09	0.63	1.58	0.56	2.94	0.61	3.60	0.79
Type III (N=21)	3.43	0.60	3.71	0.46	1.67	0.48	1.24	0.44	4.14	0.65	4.24	0.54
Type IV (N=24)	3.21	0.93	3.38	0.58	3.38	0.65	2.13	0.95	3.54	0.72	2.79	0.51
Type V (N=16)	2.50	0.82	1.57	0.51	3.56	0.81	1.44	0.73	2.25	0.78	3.19	0.98
Type VI (N=17)	1.94	0.90	2.53	0.80	3.06	0.24	1.24	0.44	3.82	0.39	4.71	0.47
Whole Group of Teachers (N=180)	3.03	0.83	3.16	0.89	3.03	1.03	1.84	0.85	3.60	0.87	3.90	0.86

* = 1: No Influence at all; 2: Only a little influence; 3: A definite influence; 4: A strong influence; and 5: A very strong influence

control at the school level and the high status of policy documents in a centralised system like that of Cyprus (Chapter 3). Similarly, the relative strengths of influence shown by the mean values of this table reveals that inspectors influenced classroom practice of five out of six clusters from "definite" to "strong" extent. Third, parents had the weakest power to influence practice. Their influence varied from almost "not at all" (1.21) to slightly more than "only a little" (2.32). This implies that the classification of teachers into these six clusters was not affected by their perceptions of parents' influence. Thus, it can be inferred that parents had little influence on the classroom practice of Cypriot teachers irrespective of the cluster to which they belong. Finally, the standard deviations are relatively small and this justifies the six-cluster solution. However, standard deviations of the sixth group are even smaller than the others and this reflects the fact that more than 80% of teachers of this group were influenced to the same extent by each of the items.

We can now look at the specific characteristics of these clusters. Teachers of the first group (N=69) were "strongly" influenced by documents and inspectors whereas colleagues, heads and pupils had a "definite" influence on their practice. Finally, parents influenced them more than "only a little". Thus, means derived from the responses of this group about the influence of these items are bigger than those of the whole group of Cypriot teachers and this implies that this group was affected to a relatively high extent by each item. We can call them "generally highly influenced"

Teachers of the second cluster (N=33) seem to be influenced more by policy documents rather than other items. Colleagues, inspectors and heads had "definite" influence on their practice but pupils and parents influenced them "only a little". Thus, teachers of this group were influenced by the centre and their colleagues but not by their "class-based clients" (ie parents and pupils). It is also important that this group was less influenced by each of these items than the general sample and this implies that teachers of this group were affected to a relatively small extent by external influences. Thus, teachers of the second group can be called, in contrast to those of the first group, as "generally uninfluenced".

Teachers of the third category (N=21) were strongly influenced by inspectors and policy documents. In addition, heads had "strong" influence on their practice. However, pupils and parents had very little influence. Thus, this is a group of teachers who were mainly influenced by their employers and can be called "contractually influenced". The fourth cluster (N=24) consisted of teachers who were influenced to a similar ("definite") extent by all the items except parents. However, parents' influence was more than "only a little influence" and this implies that this group of teachers treated all these items as able to provide suggestions but did not accept being strongly influenced by any of them. It is therefore difficult to identify either the strong effect of policy documents and inspectors upon their practice or the lack of any significant influence by parents. Thus, we can call them as "vaguely influenced".

Teachers of the fifth cluster were mainly influenced by their pupils whereas the influences of all the other items varied from "only a little" to "definite". It is also important that parents had less than "only a little" influence on them and this implies that the category of items labelled as "class-based clients" (p. 194) is not a coherent one according to the influence which each of its elements had on their practice. Thus, we can call them as "pupil-influenced".

The sixth group also was influenced by one item to a very high extent. Thus, the essential difference of the sixth cluster from all the others is that policy documents influenced them "very strongly". As a consequence, almost all of them (94%) agreed that the New Curriculum was useful for their planning. Beside, this group was "almost strongly" influenced by inspectors. It can be inferred that this group was influenced strongly by the representatives of the state but not by items which are close to the school unit. We can call them "policy influenced". However, pupils had "definite" influence on them. Nevertheless, this may reflect the fact that inspectors and policy documents are supposed to promote the chid-centred pedagogy. It is possible that these teachers accepted pupils' influence because they think that they are expected to do so. Finally, the fact that heads influenced them more than other colleagues can be attributed to the fact that heads are appointed by the government and they are supposed to promote curriculum policy. Further analysis of heads' influence and its

relation to the influence of the "political" factor is provided below.

The evidence, presented above, does not suggest a strong degree of autonomy for teachers. A strong influence was exercised by policy documents and inspectors who are supposed to guide teachers. However, heads and colleagues had also "definite" influence on their practice. The conclusion drawn from Table 5.4 does not match with that of Taylor (1975, p.177) about the sources of influences affected English primary teachers in the 1970s. This difference is, however, discussed further in Chapter 7 taking into account differences of the educational system of England in 1970s from that of Cyprus in 1990s.

Influences on curriculum practice (ideal)

Table 5.5 presents means and standard deviations of the extent to which the whole group of Cypriot teachers and five groups of Cypriot teachers wanted the items mentioned above (p. 191) to influence their practice. Following the same strategy for the selection of cluster solutions as that described above a five-cluster solution was considered as the most appropriate according to the dendrogram produced by the SPSSX (Figure D.3) and the Agglomeration schedule (Table D.8) which shows a fairly large increase in the value of the distance measure from a five-cluster (22.63) to a four-cluster solution (35.59). Thus, the following observations arise from Table 5.5.

Table 5.5 Means and Standard Deviations of the extent to which the whole group of Cypriot teachers and five groups, produced by the Cluster Analysis, want the following factors to influence their classroom practice

Group of Teachers (Number)	Teachers		Head		Pupils		Parents		Inspector		Curric. Docum	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Type I (N=35)	4.03*	0.57	4.29	0.67	3.94	0.84	3.54	0.66	4.43	0.70	4.74	0.51
Type II (N=57)	3.23	0.75	3.30	0.78	2.21	0.73	1.44	0.54	3.74	0.88	4.11	0.75
Type III (N=27)	2.15	0.60	2.96	0.76	3.70	0.61	1.19	0.40	3.70	0.70	4.00	0.96
Type IV (N=57)	3.46	0.78	3.60	0.76	4.00	0.82	2.33	0.81	3.83	0.85	3.98	0.83
Type V (N= 5)	2.00	1.00	1.20	0.45	4.20	0.84	1.00	0.00	1.00	0.00	1.80	1.10
Whole Group of Teachers (N=181)	3.27	0.92	3.47	0.92	3.40	1.11	2.08	1.05	3.81	0.96	4.10	0.91

* = 1: No Influence at all; 2: Only a little influence; 3: A definite influence; 4: A strong influence; and 5: A very strong influence

The most desirable influence for Cypriot teachers was that of policy documents. One group of teachers believed that policy documents should have "a very strong influence" and three other groups of teachers wanted policy documents to influence them strongly. This is a figure indicating that Cypriot teachers accepted that appropriate policy documents can be particularly helpful. However, they believe that parents should have "only a little influence" on their practice. Nevertheless, this is not a common perception among the five cluster-groups of Cypriot teachers since teachers of the first cluster wanted parents to have "more than a definite" influence (mean = 3.54). This is reflected in the relatively high value of standard deviation derived from the responses of the whole group of Cypriot teachers about this item.

Finally, the fifth cluster is differentiated from all the other clusters since these five teachers wanted pupils to have "more than a strong" influence on their practice whereas the influence of the other items varied from less than "definite" (documents) to "only a little" influence (head, parents). It can be argued that these teachers strongly supported teachers' autonomy and accepted the child-centred approach. Thus, we can call them "supporters of teachers' autonomy and child-centredness".

We can now look at the characteristics of the other four clusters. Teachers of the first group wanted all these six items to have "more than a definite" influence. They wanted pupils, colleagues and heads to influence them "strongly"

which implies that they welcomed any influence from the school environment. They also wanted inspectors and policy documents to be able to influence them "more than strongly". The means derived from the responses of this group of teachers are higher than those derived from the responses of the whole group of Cypriot teachers. It can be claimed that they expected all these items to influence them strongly. We can call them as "supporters of the generally highly influenced" and this group is comparable to the first derived from Table 5.4 (ie the group of the "generally highly influenced").

Teachers of the second group expected inspectors and policy documents to be able to influence them "strongly" but their colleagues and heads were expected to have "definite" influence. It can be claimed that teachers of this group welcomed any political influence but they were less keen about the influence of professional factors (ie the influence of heads and colleagues). Finally, they believed that pupils should have "only a little" influence and parents should not have any influence on their practice. This implies that they did not accept the influence of the consumer factor. Thus, we can call them as "supporters of the policy influenced" and this group is comparable to the group of "policy influenced" derived from Table 5.4.

Teachers of the third group believed that inspectors and policy documents should be able to influence them strongly. But they also wanted their pupils to have "strong influence" and heads to have "definite influence". However, they

believed that other colleagues should have "only a little influence" on their practice. It can be therefore inferred that this is a group of teachers who accepted their employers' influences but not that of their colleagues. We can call them as "supporters of the contractual influences". This group is comparable to the "conractually influenced" which derived from Table 5.4. Thus, the fact that they accepted pupils' influence can be attributed to the influence of their superiors who supported child-centred approaches. It is however very unlikely that they would agree with exchanging ideas with their colleagues or that they would attempt to develop a school policy.

Teachers of the fourth cluster wanted pupils to influence them strongly and parents to have only a little influence on their practice. They also believed that the other four items should have "more than definite" influence. Thus, this group is similar to the fifth one since both of them considered pupils' influence as the most important. However, this group of teachers considered items concerned with political and professional factors as able to have "definite" influence whereas the fifth one did not accept their influence. We can call them as "supporters of pupils as the main source of influence ".

Perceptions of actual and ideal influences on practice

The evidence presented above suggests that teachers' perceptions about items which should influence their practice were in line with Richards' (1975, p.75) suggestion about the "polyfocal" complexity of the curriculum. Cypriot

teachers, except the fifth group, did not consider themselves or particular items as the centre of the curriculum. It can be argued that Table 5.5 reveals evidence about the interrelationships which should exist according to teachers' perceptions whereas Table 5.4 presents the interrelationships which actually exist. It is also important to note that Cypriot teachers expected inspectors and policy documents to influence them strongly. This can be attributed to the effect of their experiences, derived from the process of designing and diffusing curriculum change which is followed in Cyprus, upon their perceptions. This assumption is further explored in the last sections of this chapter (Sections 2.3 and 2.4). However, the figures of Table 5.5 can not be used for evaluating the effect of curriculum policy since this question refers to the extent which teachers wanted these items to influence them in an ideal case. We can therefore infer that although policy documents and inspectors influenced classroom practice (Table 5.4) and teachers accepted that they should be able to influence their practice (Table 5.5), teachers did not consider their current influence as particularly helpful according to the figures of Table 5.1 and the interview data (Chapter 6).

Nevertheless, I decided to identify whether there was any relationship between teachers' responses to these two questions. Using the Pearson Correlation Coefficient it was possible to identify many significant relations between teachers' responses on the influences on practice of these items. Thus, I decided to examine only those with

coefficients bigger than .30 which are presented in Table 5.6. These relationships were also classified according to the educational interpretation they could provide and the following three kinds of relations emerged.

First, there was a significant relationship between the extent to which each item influenced their practice and the extent to which they wanted this item to influence it. The values of the Pearson Correlation coefficient ranged from .46 (heads) to .69 (children) and in all the cases were positive. The most likely interpretation derived from these relationships is that the more teachers wanted an item to influence them the more they were influenced by this item. It can be *therefore argued that teachers were* partly able to control the extent to which specific items influenced them. It can be also claimed that this shows that the scale is reliable and reaffirms the argument on the reliability of this scale presented in Chapter 4. Although this relationship could be also seen as suggesting that the more teachers are influenced by an item the more they wanted this item to be able to influenced them, interview data did not support this interpretation particularly due to the fact that teachers did not want to be influenced by some items (eg parents).

The second group of relations is concerned with correlations among the influence of inspectors, policy documents and heads upon their practice. Correlations were also identified among the extent to which teachers wanted these items to influence their practice. We can observe that these three

Table 5.6: Pearson Correlation Coefficients among teachers' responses on items concerning perceptions of influence on practice

No	Correlation between	Corr	n	p
A	Influenced by an item Vs would like to be influen. by it			
1	Policy documents: Infl. Vs would like	.534	184	.0001
2	Head: Infl. Vs would like	.458	182	.0001
3	Inspectors: Infl. Vs would like	.523	183	.0001
4	Colleagues: Infl. Vs would like	.537	185	.0001
5	Parents: Infl. Vs would like	.693	182	.0001
6	Pupils: Infl. Vs would like	.534	184	.0001
B	Influences of inspectors, policy documents and heads			
1	Influence: inspectors Vs documents	.335	185	.0001
2	Would like: inspectors Vs documents	.499	183	.0001
3	Influence: head Vs policy documents	.193	184	.05
4	Would like: head Vs policy documents	.367	184	.0001
5	Influence: head Vs inspectors	.526	182	.0001
6	Would like: head Vs inspectors	.662	182	.0001
C	Relations of head's and colleagues' influences			
1	Influence: head Vs colleagues	.331	184	.0001
2	Would like: head Vs colleagues	.596	185	.0001
D	Relations of pupils' and parents' influences			
1	Influence: pupils Vs parents	.318	184	.0001
2	Would like: pupils Vs parents	.348	183	.0001

items have to do with the means which government is supposed to use to guide teachers. They are also comparable with the "advisory or expert factor" identified by Taylor (1975, p.181).

The third group of relations is concerned with a correlation between the extent to which colleagues and heads influenced their practice and a correlation between the extent to which teachers wanted these two items to influence their practice. These relations can be attributed to the fact that teachers considered their heads as colleagues sharing similar experiences with them. It is however important to mention that heads' influence was also correlated with the influence of inspectors, and policy documents which represent the experts (Chapter 3) and the "centre" (Schon 1971). This finding reveals that heads act on some occasions as the formal heads of a governmental institution who are supposed to encourage the implementation of curriculum policy in this institution and on others as experienced colleagues who can help their less experienced teachers. This finding is similar to that of Taylor (1975, p.178).

The last group of correlations is concerned with a significant relationship between the influence of pupils and that of parents and a relation between the influence which teachers wanted pupils and parents to have on their practice. These relationships imply that pupils and parents may belong to the same group of influences which could be labelled as the consumer factor. This assumption is explored below.

The correlations between the influence of these items on classroom practice were further analysed by using factor analysis in order to identify underlying "factors" that explain these correlations. I used the Principal Components analysis (Strivastava and Carter 1983, pp.274-280) which creates linear combinations of the observed factors (see end note 3) as my extraction method. The SPSSX "FACTOR" procedure (SPSS Inc. 1985, 1990) was used to identify the principal components, the total variance explained by each factor (eigenvalue) and the percentage of the total variance attributed to each factor which are illustrated in Table 5.7. The cumulative percentage of the total variance, which is the percentage of variance attributed to each factor and those that precede it in this table, is also illustrated.

Table 5.7 The eigenvalue, the percentage of the total variance attributed to each factor and its cumulative percentage derived from SPSSX "FACTOR" procedure on teachers' responses to Item 33

Factor	Eigenvalue	Percentage of Variance	Cumulative Percent.
1	1.974	32.9	32.9
2	1.261	21.0	53.9
3	1.103	18.4	72.3
4	.671	11.2	83.5
5	.583	9.7	93.2
6	.408	6.8	100.0

Several procedures have been proposed for determining the number of factors to use in a model. Strivastava and Carter (1983, p. 302) mention that "an alternative rule of thumb often used in statistical packages chooses K to be the number of eigenvalues of S greater than 1". This criterion

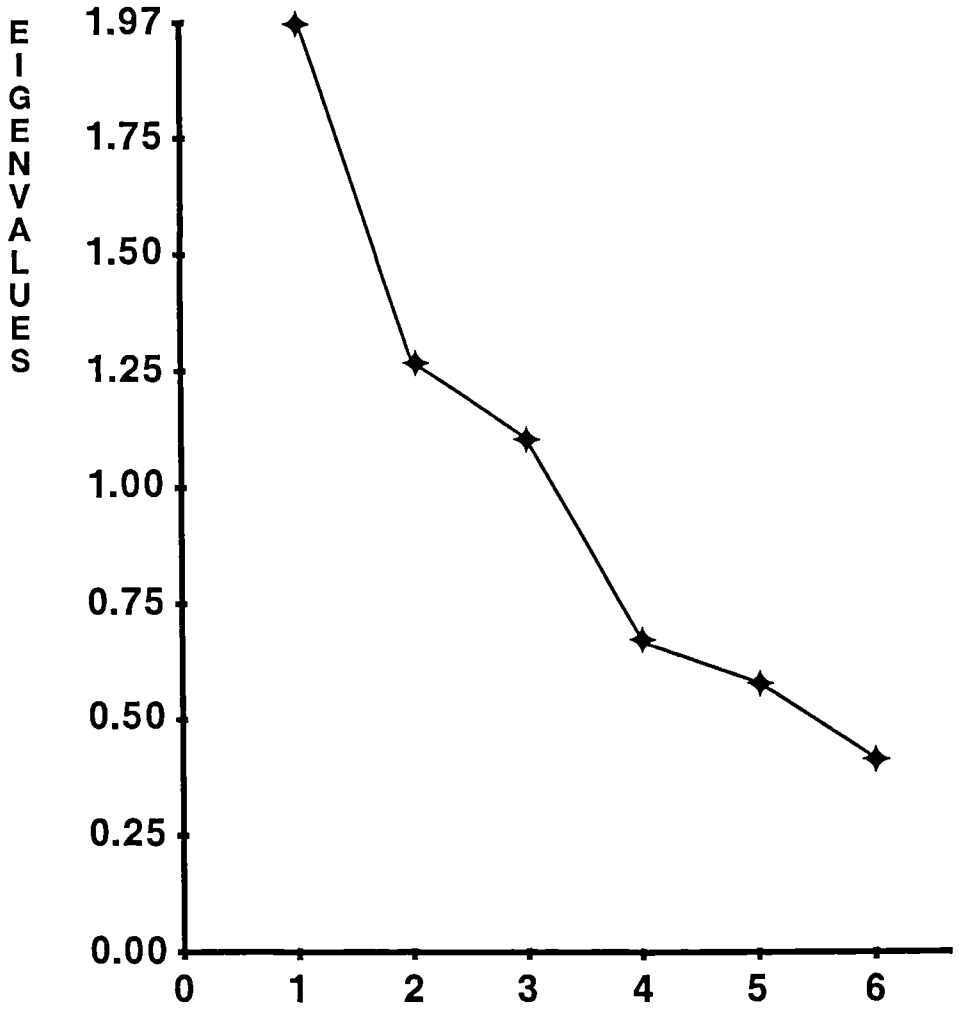
Table 5.8: Factor loadings of the three factors against the items influenced classroom practice of Cypriot teachers and their factor loadings derived from the varimax rotation procedure

A/A	Variables (Items influence Maths classroom)	FACTOR MATRIX			ROTATED FACTOR MATRIX *		
		Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
1.	Teachers' views	.5043	.1341	-.6323	.7787	-.2528	-.0424
2.	Head's views	.8127	-.0842	-.1862	.7690	.3032	.1378
3.	Inspector's view	.7808	-.3287	.1305	.5575	.6426	.1044
4.	Policy documents	.2902	-.6083	.5772	-.1029	.8795	-.0571
5.	Pupils' views	.1762	.6801	.5333	-.1628	-.0251	.8665
6	Parents' views	.5782	.5433	.1847	.3662	.0263	.7272

is also used for SPSSX (its default value of the minimum eigenvalue used to control the number of factors is 1). Thus, I chose the three factors model since Table 5.7 shows that three eigenvalues are greater than 1. Similar findings were derived from Graph 4, given on the following page (p. 205a), which is a plot of the total variance associated with each factor. The plot shows a distinct break between the steep slope of the large factors and the gradual trailing off of the rest of the factors which is called the scree (SPSS 1985). From the scree plot, we can also observe that a three-factor model should be used. Finally, Table 5.7 shows that 72.3% of the total variance is attributable to the first three factors and this means that a model with three factors can be considered as adequate to represent the data (SPSS, 1985).

Table 5.8 shows the coefficients used to express a standardized variable in terms of the factors. These coefficients are called factor loadings since they indicate how much weight is assigned to each factor. Thus, the first factor loads heavily to heads, colleagues, inspectors and parents and is not easily labelled. The second factor may labelled as the consumer influence against the political since it is positively related to parents and pupils and negatively related to inspectors and policy documents. The third factor is also not easily labelled. Thus, I decided to use the varimax rotation procedure, which is the most common of the orthogonal rotation methods (Maxwell and Lawley, 1971, Strivastava and Carter 1983, p.304), to transform the initial matrix into one that is easier to interpret.

GRAPH 4: A PLOT OF THE TOTAL VARIANCE ASSOCIATED WITH EACH FACTOR DERIVED FROM SPSSX FACTOR PROCEDURE ON CYPRIOT TEACHERS RESPONSES TO ITEM 33



PC EXTRACTED 3 FACTORS

Table 5.8 presents the rotated factor matrix. We can observe that the second factor (the political) is highly correlated to inspectors and policy documents and can be seen as a measure of the influence of political factors. It is important to note that this factor is also correlated to a lesser degree with head and this can be seen as a reflection of the fact that heads are appointed from the government to ensure the implementation of policy at the school level. Factor 3 is highly correlated with parents' influence and pupils' influence and may be interpreted as a "consumer" factor. Finally, factor 1 is highly correlated with colleagues' and head's influence and can be interpreted as a "professional" factor. It is also important that this factor is correlated to a lesser degree with parents and inspectors and these correlations may measure the relation of "professional" factor with that of "consumer" and the relation of the "political" factor with that of "professional", respectively.

Thus, it can be argued that factor analysis shows that three broad categories can be used to summarize the interrelationships identified in Table 5.4 and these are political, professional and consumer. In addition, professional factor is correlated with the political and consumer factor. However, a negative relation was identified between the influence of consumer and that of the political factor. This seems to suggest that partnership is taken for granted from policy documents since teachers

believed that the political factor acts in a different direction to that of the consumer.

Given that these six items can be classified into three broader categories, namely political, professional and consumer, teachers' perceptions about the influence of these categories were investigated by using Ward's clustering method. Thus, Table 5.9 presents means and standard deviations of the extent to which these three categories influenced classroom practice of the five groups of Cypriot teachers derived from the Cluster analysis. Figures concerned with responses of the whole group of Cypriot teachers are also illustrated. Following the same strategy for the selection of the appropriate cluster solution as that described above (p. 185) the five-cluster solution was considered as the most appropriate according to the dendrogram produced by SPSSX (Figure D.5) and the Agglomeration Schedule (Table D.9) which shows a large increase in the value of the distance measure from a five-cluster solution to a four-cluster solution.

The following observations arise from Table 5.9. First, although the means derived from responses of the whole group of teachers could suggest that the consumer factor had the least influence on Cypriot teachers, this is true for the three of the five homogeneous groups of Cypriot teachers (70%) whereas the professional factor had the least influence upon the other two groups (30%). However, there is no group of teachers which was influenced by any other factor more than by the political. In addition, influence of

Table 5.9 Means, Medians, Modes, and Standard Deviations of the extent to which the whole group of Cypriot teachers and six groups, produced by the cluster analysis, are influenced by the three factors derived from Factor Analysis.

Group of Teachers (Number)	"Consumers"* influence				"Political"** influence				"Professional"*** influence			
	Mean	Median	Mode	S.D.	Mean	Median	Mode	S.D.	Mean	Median	Mode	S.D.
Type I (N=32)	3.16	3.00	3.50	0.56	4.09	4.00	4.00	0.45	3.91	4.00	4.00	0.45
Type II (N=27)	2.21	2.00	2.00	0.54	3.09	3.00	3.00	0.80	1.93	2.00	2.00	0.39
Type III (N=46)	2.34	2.50	2.50	0.57	4.38	4.50	4.50	0.30	3.17	3.00	3.00	0.42
Type IV (N=48)	1.79	2.00	2.00	0.49	3.46	3.50	3.50	0.56	3.19	3.00	3.00	0.45
Type V (N=26)	3.23	3.00	3.00	0.47	3.35	3.50	3.50	0.39	3.06	3.00	3.00	0.46
Whole Group (N=184)	2.43	2.50	2.00	0.77	3.75	4.00	4.00	0.70	3.10	3.00	3.00	0.70

the political factor varied from "more than definite" to "more than strong". Finally, there is no group which is clearly differentiated from the others and these five groups are relatively big. We can now look at the characteristics of these five groups.

First, teachers of the first and third groups were strongly influenced by the political factor. This finding was investigated further by examining their responses on item 27a. It was found that all the teachers of these two groups agreed that the New Curriculum was useful for their planning in Mathematics. In addition, the professional factor had "more than definite" influence on teachers of these two groups and responses of teachers of these groups about the item concerned with school-based curriculum development revealed that teachers of both groups agreed with it. However, these two groups differ in the extent to which they were influenced by the consumer factor since teachers of the third group were "less than definitely" influenced whereas those of the first were "more than definitely" influenced by it. It can be claimed that teachers of the first group were influenced by all the categories to a relatively similar extent. On the other hand, there is great variation on the influence of these factors on the third group since the political factor influenced them "more than strongly", the professional influenced them "definitely", and the consumer influenced them "only a little".

Teachers of the second group were those least influenced by the professional and the political factors. They were

influenced "only a little" by the professional and "definitely" by the political factor. Their responses about professional factor is clearly differentiated from those of the other groups who were influenced "more than definitely". Teachers of this group are therefore very likely to work in isolation. In line with this assumption, they did not agree with Item 17 concerned with school-based curriculum development. They were also not influenced by the political factor and this can be linked to the fact that 31% of them did not agree that the New Curriculum was useful for their planning. It can be finally argued that teachers of this group supported teachers' autonomy.

Political and professional factors had "more than definite" influence on teachers of the fourth group whereas the consumer factor had less than "only a little" influence on them. This implies that they did not accept consumers' influence on their practice and at the same time they did not accept any dominant role for the political factor upon their practice. Finally, teachers of the fifth group were influenced equally by all these categories but their practice did not depend entirely on any of them.

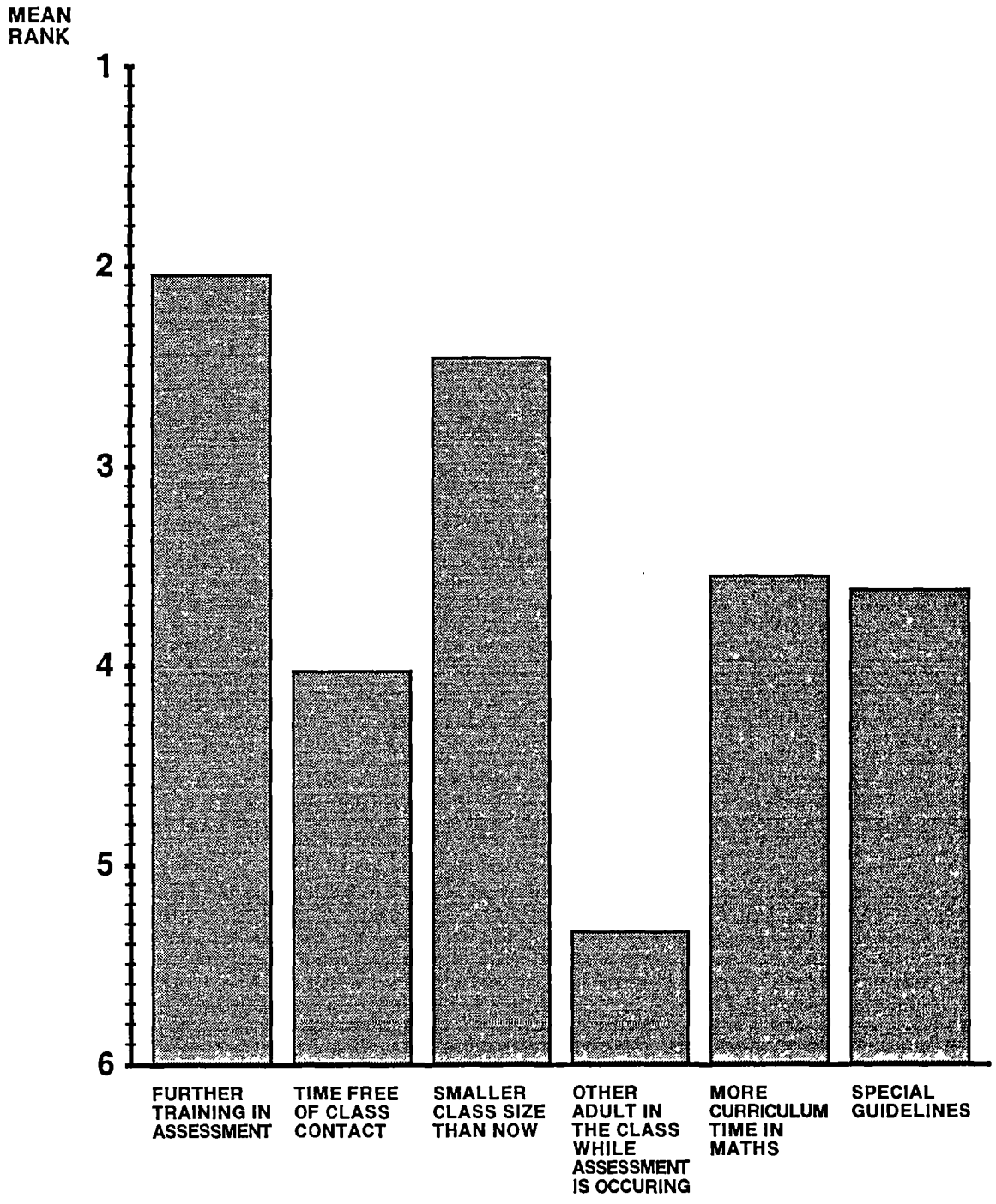
d) Perceptions about ways of improving assessment

The question associated with ways of improving assessment in Mathematics requires the ranking of six methods according to their importance. As a consequence, the relevant variables are ordinal and non-parametric statistics have been used (Kendall's non-parametric test) as in sections 1.a and 1.b. Graph 5, given on the following page (p. 210a), provides

information about teachers' perceptions of methods of improving assessment. The assumptions and shape of this graph are similar to those of Graphs 1 and 2. In addition, Kendall's coefficient of concordance and testing of its significance based on the Fisher's Z-distribution (end note 1) shows that Cypriot teachers agreed among themselves in their ranking of the relative importance of these ways of improving assessment ($W=.40$, $Z=2.378$, $V_1=4.989$, $V_2=888$ and $p<.001$).

It emerges clearly from Graph 5 that the most important ways of improving assessment, according to Cypriot teachers, were further training in techniques of assessment and smaller class size, since their mean ranks are very close to 2.00 (2.04 and 2.43 respectively), whereas the least important was the existence of another adult in the classroom (5.33). The fact that 5.33 is close to 6.00 and that the mean rank of the next least important purpose, that of time free of class contact (4.03), has a big difference from this suggests that the presence of another adult was seen as the least important way of improving assessment. The other way which is differentiated from all the other ways of improving assessment is the one concerning time free of class contact (4.03). Its difference from the two next methods which have smaller mean ranks than this (curriculum time, and guidelines from a staff meeting) is up to 0.5. It can be inferred that time free of class contact was seen as the next least important way whereas the other two ways as neither among the most nor among the least important ways.

GRAPH 5: CYPRIOT TEACHERS PERCEPTIONS ABOUT THE WAYS OF IMPROVING ASSESSMENT IN MATHEMATICS



The last part of this section is mainly concerned with one of the ways of improving assessment perceived most important, namely the need for further training in techniques of assessment. Teachers' opinion that this further training in techniques of assessment is one of the most important ways of improving assessment identifies a training need. It is interesting to note in this respect the findings derived from Graph 3 revealing that teachers considered structured observation and interview as the most appropriate but least easy techniques. This suggests that further training should concentrate on these techniques. This finding can be also linked with their perception about Item C.4 of Table 5.1 which shows that INSET should mainly deal with problems which teachers have to face in their classroom. Thus, figures derived from Table 5.1, and Graphs 3 and 5 reveal that Cypriot teachers considered further training in techniques of assessment, rather than publication of policy documents which are rarely used for assessing in Mathematics (Table 5.1, Item C.2c), as the most important way of improving assessment. Training should be focused on the use of structured observation and pupils' interview for assessment in Mathematics.

1.2 QUESTION 2: Is there any correlation between teachers' perceptions about different items concerning the curriculum reform in Mathematics?

A) Purposes of teaching Mathematics and methods of teaching and assessment in Mathematics

The purpose of this section is to examine the relationship between teachers' perceptions about general aims for the curriculum in Mathematics and methods of teaching and

assessment. The correlation coefficients provided are a way of stating the extent to which one variable is related to another. However, the fact that the question related to the general aims for the curriculum in Mathematics asked teachers to rank purposes according to their importance, whereas the question related to the ways of teaching and assessment asked them to express their agreement, creates difficulties for illustrating this relationship. Nevertheless, using the Spearman correlation coefficient it was possible to show a relationship between teachers' perceptions about the aims of Mathematics and ways of teaching and assessment in Mathematics.

First, there was significant relationship between the Cypriot teachers' perceived importance of the purpose of Mathematics concerned with how children could solve investigative tasks and their agreement with a teaching approach based mainly on practical investigations (Questions 13d and 25), ($r=-.13$, $n=176$, and $p<.04$). There was also a significant relationship between the perceived importance of this purpose and agreement with assessment of children's ability to apply Mathematics in unfamiliar situations ($r=-.16$, $n=177$, and $p<.017$)

Second, a correlation between views on the purpose of Mathematics concerned with the development of positive attitudes to Mathematics and the opinion that assessment of pupils' attitudes to Mathematics is important was identified ($r=-.13$, $n=174$, and $p<.05$).

Table 5.10: The values of Spearman Correlation between the following Items of Mathematics pedagogy (Part A) and between influence on practice and classroom organisation (PartB)

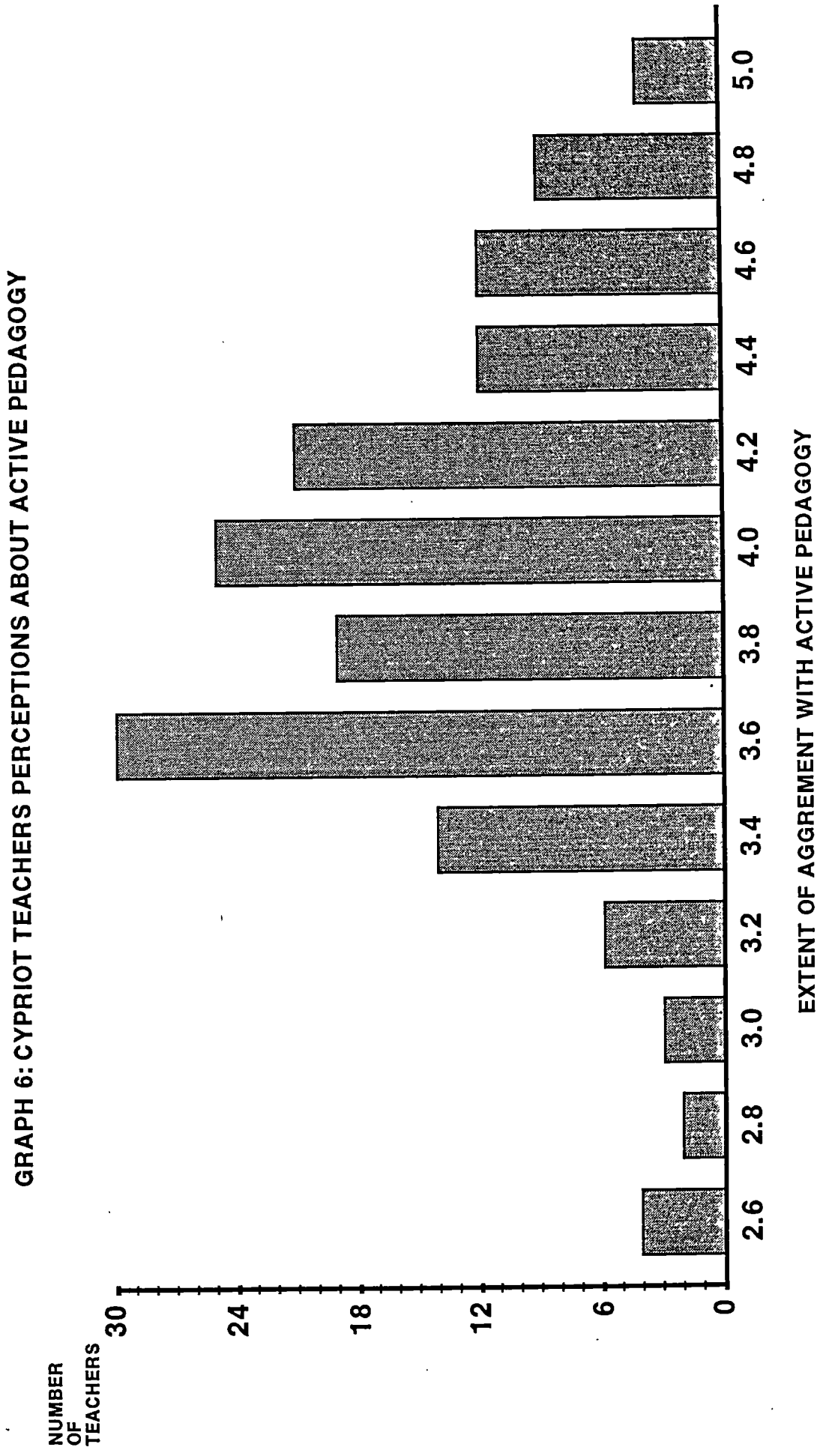
No.	Pair of Items Correlated	Value of Spear. Corr.	Number	p
A)	Items about Mathematics Pedagogy			
1)	Practical activities for Key Stage 1 as for Key Stage 2 Vs. Practical act/ies for high attaining pupils as for low attainers	0.49	168	.001
2)	Practical activities as appropriate for Key Stage 1 as for K.S.2 Vs. Pupils talk about their results	0.21	183	.003
3)	Pract. activ. for high attaining pupils as for low attainers Vs. Pupils talk about their results	0.21	167	.003
4)	Pupils talk about their results Vs Cross-curricular approach.	0.27	177	.001
5)	Mathematics mainly taught through investigations Vs. Practical activ. as for Key Stage 1 as for K.S. 2	0.14	183	.033
6)	Pupils talk about their results Vs. Maths through investigations	0.28	181	.001
7)	Maths mainly through investigations Vs Cross-curricular approach	0.22	177	.002
B)	Classroom Organisation Vs. Influence on Practice			
1)	Time spend on Individual tasks and head's Influence	0.18	182	.009
2)	Time spend on Collaborative Tasks and head's Influence	0.15	182	.026
3)	Time spend in Working as whole class and head's Influence	-0.23	182	.001
4)	Time spend on Individual tasks and Inspectors' Influence	0.18	184	.008
5)	Time spend in Working as whole class and Inspectors' Influence	-0.23	184	.001

Finally, there was correlation between support for the general aim of Mathematics related to mathematical communication (Question 13a) and the need for children to present their activities to their classmates (Question 20) ($r=-.12$, $n=176$, and $p<.05$).

B) Correlations between teachers' perceptions about different methods of teaching Mathematics

This section is concerned with significant relationships between teachers' responses to items concerned with different issues of Mathematics pedagogy. Table 5.10, given in the next page, illustrates all these significant relationships, and where it is shown that teachers' responses to items concerned with an active pedagogy are interrelated. This implies not only that the reliability of the scale used to measure teachers' perceptions of teaching Mathematics is high (see Chapter 4) but also that Cypriot teachers had a coherent view in support of active pedagogy.

Despite problems of methodology arising from the fact that data on teachers' perceptions about Mathematics pedagogy do not really constitute an interval scale (see p. 170), I treated teachers' responses as constituting an interval scale and a variable called "perception about active pedagogy" representing an average of teachers' responses to methods related to active pedagogy (Table 5.1 Items A.2, A.3, A.4, A.6 and A.7) was constructed. However, against the methodological problem, the distribution of the teachers' responses about the artificially constructed variable is similar to the normal distribution. This can be mainly identified by the distribution of the number of teachers who


GRAPH 6: CYPRIOT TEACHERS PERCEPTIONS ABOUT ACTIVE PEDAGOGY
NUMBER OF TEACHERS
30
24
18
12
6
0
2.6
2.8
3.0
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6
4.8
5.0
EXTENT OF AGGREMENT WITH ACTIVE PEDAGOGY

used each number of the scale given in Graph 6 (see p. 213a). It can be also partly examined by comparing the median and the mean of teachers' responses to this variable (4.00 and 3.93 respectively) since for a normal distribution these two numbers should be very close.

We can now observe that both the mean and the median of this variable represent an overall agreement with active pedagogy. The range of teachers' responses to this variable is from 2.60-5.00 indicating a small variation among teachers' responses and that there was no teacher who disagreed with active pedagogy. It can be therefore claimed that Cypriot teachers did not simply agree, as a group, with active pedagogy but there was a coherent view about it reflected in the small value of the standard deviation of their responses to this variable (SD=0.52).

C) Correlations between teachers' perceptions of issues of Curriculum Change:

C.1 Using the New Curriculum for planning, teaching and assessment in Mathematics

This section attempts to identify relations between teachers' responses on whether having the New Curriculum is useful for teachers' planning (Item 27a) for carrying out their teaching (Item 27b) and for assessing (Item 27c). Significant relationships were identified among teachers' responses to these three items indicating that this question is highly reliable (see Chapter 4). It can also be argued that this finding implies a perceived inter-relationship between planning, implementation and assessment reflecting teachers' acceptance of the model of objectives upon which

officials of the Ministry of Education built policy documents (Chapter 2, Appendix A).

However, the relatively higher value of the Spearman Correlation coefficient between using the New Curriculum for carrying out teaching and for assessing than those between planning and carrying out teaching, and planning and assessing can be attributed to the fact that the stages of implementation and assessment are more clearly linked with curriculum than is the case for planning. The findings from the Spearman correlation coefficient are as follows:

a. Planning Vs. Implementing:
   Coefficient = .18, n = 164, $p<.01$

b. Planning Vs Assessing:
   Coefficient = .33, n = 165, $p<.001$

c. Implementing Vs Assessing:
   Coefficient = .45, n = 164, $p<.001$

C.2 Sources of Influences on practice and Curriculum Organisation

This section investigates relations between the extent to which various factors influenced teachers' practice and the proportion of time their pupils spent in working on individual tasks, on collaborative tasks and as a whole class. Since data measuring the relevant items were considered as interval (see p. 191), the Pearson Correlation Coefficients, presented in Table 5.10, have been calculated to identify significant relationships between influence on practice and classroom organisation. The values of Pearson Correlation Coefficient show that the extent to which inspectors and heads influenced classroom practice are related to how teachers organised their classroom. It was

found that there were negative relations between influences of these two factors and time spent in working as a whole class, and positive relations between their influences and time spent in working on individual and group tasks. This reflects the fact the policy initiatives encouraged a child-centred approach and criticised the teacher-centred approach and that this is the kind of advice inspectors and heads are supposed to give.

It is, however, important to indicate that the extent of influence from policy documents was not related to how teachers organised their classroom. Although this seems to be counter to the figures of Table 5.4 indicating that these documents had strong influence upon classroom practice, this apparent contradiction can be attributed to the fact that policy documents were influential in terms of the content of teaching rather than the pedagogy. This assumption seems to be in line with the differential effect of the New Curriculum of Cyprus upon planning, carrying out and assessing the Mathematics lessons, identified above (p. 176 and 214).

1.3 QUESTION 3: Are there differences among Cypriot teachers' perceptions according to group and sub-group characteristics?

This section is an attempt to identify whether there is any association between teachers' characteristics measured by the independent variables of the questionnaire (Part A) and their perceptions of curriculum reform in Mathematics. However, in attempting to compare the findings derived from

the dependent variables of the questionnaire (Part B, C and D) we have to take into account the scale used to measure these items of the questionnaire. Thus, parametric tests (t-test and ANOVA) were used to measure differences in perceptions associated with interval data whereas non-parametric tests (Kolmogorov-Smirnov two-sample test, Kruskal Wallis one way analysis of Variance and Chi-square test) for differences on perceptions associated with ordinal and categorical data (see Chapter 4). The independent variables used to examine possible sources of differences between perceptions of various groups of Cypriot teachers can be classified into three categories.

A) Professional Training

The first category is concerned with the effect of professional training upon teachers' perceptions and this is an attempt to investigate further findings on the effect of professional training upon teachers' thinking (Tabachnick and Zeichner, 1985; Zeichner et al, 1987) and explore assumptions about the process of change raised by the policy documents (Chapter 3).

A.1) Specialisation in Mathematics at Initial teachers' training level or In-Service training level

An independent variable concerned with teachers' professional development in Cyprus is whether or not teachers attended specialised Mathematics courses at initial teachers' training level (PAC) or in service training (PI). Since the content of these courses at PAC and PI are not the same, their influences on teachers' perceptions were examined separately. The figures derived from Kolmogorov-

Smirnov two sample tests, chi-square tests, and t-tests show that there is no statistically significant difference ($p<.05$) between teachers who specialised in Mathematics at initial teachers' training level and those who did not. Similarly, there was no statistically significant difference between perceptions of teachers who took specialised courses at INSET (PI) and those who did not take any INSET course in Mathematics.

Although the difference on the content of these courses has been already acknowledged, I compared perceptions of teachers who took specialised courses in Mathematics (either at Initial or In-Service training) with those who never attended any specialised course in Mathematics. The figures from relevant t-tests, Kolmogorov-Smirnov two sample tests, and chi-square tests showed that there was no statistically significant difference between these two sub-groups of Cypriot teachers. It can be therefore claimed that the attendance of specialised courses in Mathematics has nothing to do with teachers' perceptions of curriculum reform in Mathematics. This suggests that the primary teachers' perceptions are framed in a general, rather than a subject-specific, policy perspective.

A.2 Attendance of Compulsory In-Service Training Courses

The other variable associated with Cypriot teachers' professional training and development was attendance at compulsory courses offered by the Pedagogical Institute in order to improve the status of primary teachers (see Chapter 3). It was possible to make a comparison between the

perceptions of teachers who had attended these courses when they answered the questionnaire with those who had not and control at the same time ITT qualifications and length of teaching experience. Thus, a comparison between the perceptions of two sub-groups of Cypriot teachers who had attended three years initial teacher training programme and had less than 10 years of teaching experience, but members of the one sub-group had attended this INSET programme whereas those of the other had not, was undertaken. T-tests, Kolmogorov-Smirnov two sample tests, and chi-square tests showed that there was no statistically significant difference between the perceptions of these two sub-groups. This finding can be attributed to the fact that these courses are not focused on issues relevant to curriculum theory or curriculum practice (see Chapter 3).

B) Teaching Experience and Initial teacher Training

T-tests, Kolmogorov-Smirnov two sample tests and chi-square tests revealed that Cypriot teachers who attended two years initial teacher training program had different perceptions from Cypriot teachers who had been trained for three years. In addition, ANOVA, Kruskal-Wallis one-way analysis of variance and chi-square tests showed that teachers' perceptions varied significantly with experience. However, historically two years training occurred before three years training (up to 1968). Thus, length of initial teacher training was closely associated with experience (Spearman Correlation=-.6174 n=185 $p<.001$). It was not possible to differentiate the association between teachers' perceptions and initial training from that between perceptions and

teaching experience. Moreover, discriminant analysis could not be used since items of the questionnaire which measured perceptions of curriculum reform in Mathematics provided ordinal and categorical data and thus they can not be used as classification variables (SPSS Inc. 1985, p.73).

B.1) Teaching Experience

In order to measure the association of experience with perceptions, I decided to compare perceptions of teachers who attended a three years initial teacher training program, according to their experience. A similar comparison among teachers who attended a two years initial teacher training program was not possible since the teachers who graduated before 1968 are those who attended a two years initial teacher training program and hence all of them have more than 24 years of experience. Thus, teachers who attended two years initial teacher training program belong to the same group of teaching experience (more than 20 years) according to the way experience was categorised by item 2 of the questionnaire (Appendix B).

Although the item measuring teaching experience should enable us to classify teachers who attended three years training program into four groups (2-5, 6-10, 11-20, 21-24), in practice they could be only classified into two groups because of the small numbers in the last two categories and the fact that statistical tests require relatively equal groups. Thus, the first group consisted of teachers who had less than 10 years experience. The second one consisted of teachers who had more than 9 but less than 25 years of

experience. It was not possible to break down the second group because of the small number of teachers who had more than 20 years of experience and attended three years initial teacher training (n=13). Thus, a comparison between perceptions of teachers who had less than 10 years experience with perceptions of teachers who had more than 9 years did not have to face methodological problems related to the sizes of these two groups since these groups have relatively similar sizes as is required for the use of the statistical tests. The following statistically significant differences emerged from the t-test, the Kolmogorov Smirnov two sample test, and the chi-square test.

First, the Kolmogorov Smirnov two sample test revealed only one statistically significant difference according to teachers' perceptions of purposes of teaching Mathematics. Less experienced teachers considered the purpose concerned with how children could gain Mathematical knowledge as less important than older teachers (K-S $Z=1.686$, $p<.007$). This difference was particularly important since the cumulative frequencies of teachers who had more than 9 years experience are greater throughout than that of the group of less experienced teachers and this implies that more "experienced" rather than new teachers attached more importance to this purpose.

Second, the Kolmogorov Smirnov two sample test revealed two statistically significant differences between the perceptions of these two groups about the implementation of curriculum policy. It was found that more of the less

experienced teachers disagreed that assessment should be based on outcomes rather than process (K-S Z= 1.894, p<.002) and that there is a fixed sequence of Mathematical topics which pupils should be taught (K-S Z= 1.423 p<.04). Third, the chi-square test revealed that there was a statistically significant difference between perceptions of these two groups about the document which they used most frequently for planning their Mathematics teaching (X^2=10.255, p<.016). Table D.10 presenting their responses to this item reveals that more less experienced teachers used textbooks (64.9%) than older teachers (56.8%). However, the majority of teachers of both groups used textbooks rather than any other document for planning.

Fourth, the t-test revealed statistically significant differences between perceptions of classroom organisation. More experienced teachers were able to organise their teaching in such a way that more time was spent on collaborative group tasks (t=-2.53, p<.013) and less time in working as a whole class (t=2.53, p<.013) compared to teachers who had less than 10 years of experience.

Fifth, the t-test revealed the following statistically significant differences between teachers' perceptions of influences on practice. Less experienced teachers wanted parents (t=-2.04, df=114, p<.05) and inspectors (t=-1.98 df=114, p<.05) to be able to influence them to a lesser extent than did more experienced teachers. However, the two groups did not have extremely different perceptions. It could be claimed that the mean values of their responses

show that both groups wanted inspectors to have more than "definite" influence but "less than stronger" (3.54 and 3.90 respectively) and that parents should have "only a little influence" (1.86 and 2.20 respectively). Finally, in practice inspectors influenced experienced teachers more than less experienced teachers ($t=-2.53$, $df=114$, $p<.013$). This can be attributed to the fact that only teachers who have more than 9 years experience are appraised by inspectors and hence inspectors visited these teachers more often than those who had less than 10 years of experience in order to find out whether they were able to implement the active pedagogy, which is promoted by the curriculum policy of Cyprus. On the other hand, this difference might be attributed to the two differences mentioned above suggesting that younger teachers were more keen about teachers' professionalism and wanted to be autonomous and able to determine their practice.

Finally, the Kolmogorov-Smirnov two sample test did not reveal any statistically significant difference between the two groups' perceptions about the ways of improving assessment or between the extent to which they felt confident to teach and assess in Mathematics.

Having in mind all these statistically significant differences, we can observe that more of the less experienced teachers agreed with items concerned with progressive ideology than more experienced teachers and they wanted to be more autonomous and not to be influenced by either the political or the consumer factor to such a high

extent as the more experienced teachers. However, more experienced teachers organised their classroom in such a way that their pupils spent less time in working as a whole class and more time on collaborative tasks. In addition, their planning was not dependent so much on textbooks as that of younger teachers. Thus, the mismatch between the perceptions of more experienced teachers and their classroom practice was smaller than that of less experienced teachers.

B.2) Initial teacher Training

A comparison between teachers who had more than 20 years of experience and attended the three years initial teacher training program (ie they had less than 25 years of experience) with teachers who had more than 20 years of experience but attended the two years training program was the only possible comparison for measuring the association between initial teacher training and perceptions. If we assume that teachers who had 20 up to 24 years of experience and teachers who had more than 24 years of experience had effectively similar experience, we can claim that this comparison attempts to measure any association between initial teacher training and perceptions. However, there is a methodological problem since most teachers who had more than 20 years of experience attended two years training program (53 out of 66) and hence these two sub-groups do not have similar sizes.

Nevertheless, comparisons between perceptions of these two groups by t-tests, Kolmogorov-Smirnov two sample tests, and chi-square tests revealed that there was no statistically

significant difference between these two sub-groups of Cypriot teachers. Although it could be simply inferred that this finding implies that there is no association between teachers' perceptions and initial teacher training qualification, the lack of any statistically significant difference between these two sub-groups might be due to the fact that the training happened twenty years ago and its effect has diminished over time. A similar comparison twenty years ago might have found some differences. This is an issue discussed further in the last chapter.

C) The Class-based focus of teachers' perceptions

It has been already argued (Chapter 3) that the Ministry of Education attempted to change the curriculum using a centre-periphery model with the process of change designed and diffused by a central committee (inter-departmental committee in Mathematics) without encouragement of curriculum development at school level. Thus, this section does not provide evidence on how the development of school policy affects teachers' perceptions so much as on whether different working contexts were associated with differences in teachers' perceptions. The variables used to define various groups of Cypriot teachers have to do with various characteristics of the classes where they taught Mathematics. The focus of teachers' perceptions on the "Class-Based Curriculum" can be identified through these comparisons.

C.1) Class size

A variable related to teachers' working conditions is that of the size of their classes measured by Item 9 of the questionnaire (Appendix B). Data derived from this item

allow me to compare perceptions of curriculum reform between more than two groups of Cypriot teachers. Thus, ANOVA, Kruskal-Wallis one way analysis of variance, and Chi-square test for k-independent samples were used to compare perceptions of these groups. It is, however, important to indicate that teachers who teach classes of more than one year group have classes with smaller number of pupils (Spearman Correlation Coefficient=-.23, n=185 p<.001). This is due to orders on how small primary schools should operate (Ministry of Education 1991c, 1993).

It was, therefore, decided to create different sub-groups of teachers who taught classes with only one year group, according to the size of their classes. Thus, findings derived from comparisons between teachers' perceptions of these sub-groups have nothing to do with the fact that some of the teachers have to teach classes of more than one year group. The association between teachers' perceptions and the number of different age groups of pupils they had to teach is examined below (Section C.3).

A comparison between the following three sub-groups of teachers all of whom taught single age classes was attempted:

a) Teachers who worked in a primary class with up to 20 pupils. This is a group of teachers who worked in a relatively small classes and consisted of 32 teachers (17% of the sample).

b) Teachers who worked in a class of 21 up to 28 pupils. The size of their classes is close to the mean size of

primary classes in Cyprus (26). There were 86 teachers in this sub-group (46.5% of the sample).

c) Teachers who worked in classes with more than 29 pupils. Cypriot teachers are supposed to have less than 36 pupils in their classes and that was the case with the 46 teachers of this sub-group of my sample (25% of the sample).

Kruskal-Wallis one-way analysis of variance revealed the following four statistically significant differences between these three groups of teachers. First, confidence about teaching Mathematics (K-W=7.03, df=2, p<.03) and assessing pupils ability in Mathematics (K-W=8.76, p<.013) varied significantly with class size. By examining the responses of these three groups, we can observe that the third group felt less confident in both teaching and assessing than the other two. Second, teachers' perceptions about the content of Mathematics curriculum (Item 30) varied significantly with class size (K-W=8.39, p<.015). Responses of these sub-groups to this item show that more teachers of the third group rather than those of the second believed that the content of the curriculum can not be easily understood by their pupils. Third, perceived ease of unstructured observation varied significantly with class size (K-W=10.24, p<.006). Unstructured observation was considered as less easy by teachers of the third group than those of the other two groups.

Finally, the perceived importance of having a smaller class as a way of improving assessment varied, as would be

expected, with class size (K-W=9.87, p<.007). More teachers of the third group considered reduced class size as an important way of improving assessment than those of the first. This finding can be easily justified and reveals the importance of comparing teachers' perceptions according to class size. Kolmogorov-Smirnov two sample tests revealed that all the differences between perceptions of the above sub-groups about these four items were statistically significant and their values are illustrated in Table D.11.

ANOVA did not reveal any statistically significant difference either according to the way teachers of these three groups organised their Mathematical classroom or in their perceptions about influences on their classroom practice. Furthermore, the chi-square test showed that there was no statistically significant relation between class size and teachers' distribution to the groups of the various cluster-solutions used to describe teachers' responses to the above items (Tables 5.3, 5.4, 5.5, 5.9). The lack of variation on the perceptions of influences on practice between these three groups can be attributed to the fact that the centre exercised the same extent of control at all the Cypriot schools and that Cypriot schools do not differ significantly since there is no school based curriculum development in Cyprus (Chapter 3). This finding is explored further in Section 2.1. On the other hand, the lack of variation in ways classes of different sizes were organised by Cypriot teachers suggests that when teachers had to organise their Mathematics classroom they did not take into account the size of their class. This can be also

linked to the interview data presented in Chapter 6 which suggest that teachers mainly used the whole class teaching rather than other ways of classroom organisation due to the fact that by using this approach a topic can be taught more quickly and this helped them to cover the content of the New Curriculum in Mathematics during the limited time in which they had to do it.

However, the chi-square test revealed a statistically significant difference in responses on item 37 concerned with pupils' self-assessment (X^2 = 10.23, df=4, p<.037). Table D.12 of Appendix D illustrates responses of these three groups to this item. We can observe that more teachers with a large class believed that their pupils could assess themselves than those with a small number of pupils (26%, 44% and 61% of the first, second and third group respectively). In addition, more teachers with small classes believed that their pupils were not able to assess themselves rather than those with a large number of pupils (26%, 19%, and 18% for the first second and third group respectively). This finding can not be easily explained since neither quantitative nor qualitative data have raised anything which can be linked to this statistically significant difference. It might however be thought that this difference has to do with the fact that teachers of large classes had to spend more time assessing their pupils' achievement in Mathematics than teachers with small classes and so they tried more often to use this technique of assessment than other teachers.

C.2) Teaching Mathematics to older (Year 5 or Year 6) or younger (Year 1 or Year 2) primary pupils: Teaching at Cycle A or Cycle B

The other difference among the characteristics of teachers concerned with the "Class Based Curriculum" can be defined by teachers' responses to item 10 of the questionnaire (Appendix D) which asked teachers to indicate the year groups which there were in their classes. The fact that a specific items of the questionnaire (Item 18) measures teachers' perceptions on a possible relation between pupils' age and appropriateness of teaching methods justifies further the comparison attempted in this section.

Since Cypriot primary schools comprise six different year groups of pupils (Year 1 to Year 6) and most of the Cypriot teachers (89%) have only one year group in their classroom, I decided to compare Cypriot teachers' perceptions according to the year group of their pupils. Kruskal Wallis one way analysis of variance, ANOVA and chi-square tests revealed the following statistically significant differences within these six groups of teachers. First, teachers' perceptions on whether the requirements of the New Curriculum in Mathematics are manageable varied according to the year group they had to teach ($K\text{-}W = 25.63$, $p<.001$). Comparing the sums of the mean ranks (R) of each year group we can see that the R of Year 1 (49.58) differs from all the others which range from 84.21 to 101.05. Lehmann and D'Abrera (1975, p.205) considered the value of the sum of the mean rank as an indication of the variation of the responses. Thus, teachers of Year 1 considered the New Curriculum as less appropriate than the others and a criticism of the

content of the New Curriculum for pupils of Year 1 can be also drawn.

Second, the Kruskal-Wallis one-way analysis of variance revealed that teachers' perceptions on whether the New Curriculum was useful for carrying out their teaching in Mathematics varied according to the year group they had to teach (K-W=15.93, p<.007). Teachers of year 1, as a group, disagreed that the New Curriculum was useful but perceptions of teachers of each of the other five groups varied from disagreed to agreed. It can be therefore inferred that the New Curriculum was less useful for teachers of Year 1 than for teachers of the other year groups and that its content was perceived as less appropriate from Year 1 teachers than for teachers of other years. This argument is examined further below.

The last statistically significant difference identified by Kruskal Wallis one way analysis of variance reveals that teachers' perceptions of the importance of the summative purpose vary according to the year group of their pupils (K-W=16.18, p<.006). This difference has to do with different perceptions of teachers of Year 6 from teachers of other Year groups since their responses show that teachers of Year 6 are not so critical about the summative purpose of assessment as all the others who considered it as the least important purpose (Table D.13). This might be a reflection of the fact that teachers of Year 6 took into account that their pupils would be pupils of a secondary school in a few months and would be assessed for summative purposes.

The differences identified above were that teachers of both the oldest or the youngest pupils had different perceptions from all the others. As a consequence, I decided to compare perceptions of teachers who had to teach the youngest pupils of primary schools in Cyprus (ie Year 1 or Year 2) with those who had to teach the oldest (Year 5 or Year 6). The Kolmogorov-Smirnov two sample test, the t-test, and the chi-square test revealed the following statistically significant differences.

First, the chi-square test revealed a statistically significant difference in the responses of these two sub-groups to *Item 37 of the questionnaire concerned with* whether pupils of their classes know enough Mathematics to be able to assess themselves (X^2=6.91, df=2, and p<.032). Table D.14 of Appendix D presents the distribution of the responses of these two sub-groups and shows that 57.9% of Cypriot teachers who taught the oldest pupils believed that their pupils were able to assess themselves, in contrast to only 33.3% of teachers of the youngest pupils. It can be therefore claimed that more teachers of the oldest pupils believed that pupils' self assessment provides valid results than the group of teachers who taught either Year 1 or Year 2 pupils. This might provide an explanation for the variation among the responses of Cypriot teachers about this item (see p.175) which can be attributed to the fact that it reflects variation of pupils' abilities in Mathematics. On the other hand, the chi-square test does not reveal any statistically significant difference in which documents are used by teachers of these sub-groups for planning their

Mathematics lessons (ie Item 32) or on the way teachers are distributed to clusters as shown at Tables 5.3, 5.4 and 5.5.

Second, a comparison of perceptions of these two groups about items concerned with ordinal data by the Kolmogorov-Smirnov two sample test revealed that fewer teachers of the youngest pupils agreed that having the New Curriculum was useful for them for carrying out their Mathematics lessons than teachers of oldest pupils (K-S $Z=1.45$, $p<.03$). The fact that the cumulative frequencies of the group who taught younger pupils are greater throughout than the group who teach older pupils implies that the policy on teaching mathematics as it is reflected in the New Curriculum is seen as less appropriate for younger pupils than for older pupils.

Finally, the t-test revealed the following three statistically significant differences which are presented in a summary form in Table D.15 of Appendix D. The first one is concerned with the fact that the proportion of time younger pupils were working in collaborative group tasks was less than that of the older pupils. This difference can be attributed to the fact that teachers accepted the suggestions of policy documents indicating that younger pupils are not able to work easily in collaborative group tasks. In supporting this argument, it is important to indicate that no other statistically significant difference about how these two sub-groups organised their classroom has been identified.

The second and third differences were to do with the extent to which parents influenced curriculum practice and how teachers wanted them to be able to influence practice, respectively. Teachers of younger pupils were influenced to a smaller degree by parents than teachers of older pupils. In addition, teachers of younger pupils believed that parents should influence them to a smaller degree than that which teachers of older pupils wanted parents to influence them. These differences reveal an association between parents' interest about their pupils' achievement and pupils' age which can be attributed to the fact that older pupils are closer to external examinations and their "future life" is going to be "affected" more by their educational attainment than younger pupils. We can also observe that teachers of both groups wanted parents to be involved to a bigger extent than that to which they were actually involved.

It was finally possible to compare teachers' perceptions according to whether they teach at Cycle A (Year 1, Year 2 and Year 3) or Cycle B (Year 4, Year 5, and Year 6) and this comparison is based on how the government classifies primary schools. It is, however, important to indicate that teachers of Year 3 and teachers of Year 4 have to teach the same Mathematical topics and at almost the same level of difficulty. This was reflected in the fact that comparison between teachers of Year 3 and those of Year 4 revealed no statistically significant difference in any of their responses to the questionnaire. Comparison between perceptions of teachers of Cycle A with those of Cycle B

revealed, as was expected, the same statistically significant differences as those identified by comparing the sub-group of teachers of Year 1 and Year 2 with the sub-group of teachers of Year 5 and Year 6 pupils. This can be attributed to the fact that including Year 3 with the sub-group of Year 1 and Year 2 (Cycle A) and including Year 4 with sub-group of teachers of Year 5 and Year 6 (Cycle B) does not make the comparison of Cycle A with Cycle B different from comparing the sub-group of Year 1 and Year 2 teachers with the sub-group of Year 5 and Year 6.

C.3) Working in classes with one, two or more than two age groups of pupils

Since most of the Cypriot teachers work with classes with only one age group of pupils and very few teachers work with classes with more than two age groups of pupils, teachers were classified into three groups. The first group was teachers who taught only one age group and were the majority (88.6%) the second were those who taught to classes with two year groups (7.6%) and the last group was the few teachers who taught classes with more than two age groups of pupils (3.8%). Despite problems of methodology arising from the fact that the sizes of these three groups were not similar, I decided to compare the perceptions of these three groups of Cypriot teachers. The only statistically significant difference concerned the documents used by teachers to plan their teaching in Mathematics (X^2=18.217, df=6, p<.01). Table D.16 of Appendix D shows that more teachers who had to teach only one age group of pupils (58.9%) used textbooks for their planning than teachers who had to teach two age groups of pupils (42.9%) or even to more than two age groups

of pupils (28.9%). The explanation may be that textbooks are published according to the needs of teachers who work in single age group classes.

It was also decided to compare teachers who worked with classes with two different age groups of pupils with those who worked with more than two age groups of pupils in order to limit methodological problems since these two groups are both relatively small. No statistically significant difference between the perceptions of these two groups has been identified, supporting the findings identified above. No statistically significant difference was found by comparing teachers of classes with one age group of pupils with those of two age group of pupils. The only statistically significant difference according to the number of age groups of pupils is that concerned with the kind of documents that teachers used for their planning. This difference is statistically significant only between teachers with one age group and more than two age groups (X^2=13.974, df=3, p<.003) according to the values of chi-square tests derived from the comparisons between pairs of these three groups.

The findings concerned with any possible association between Cypriot teachers' perceptions and their characteristics, presented in this section, will be explored further in the next section by using other samples of teachers and comparing their perceptions.

2) FINDINGS FROM QUESTIONNAIRE TO SEVERAL SAMPLES OF TEACHERS: TEACHERS OF FIVE CYPRIOT PRIMARY SCHOOLS, AND BEGINNING TEACHERS (CYPRUS AND ENGLAND).

2.1 Perceptions of teachers of five big primary schools in Cyprus

Perceptions of teachers of five primary schools were examined in order to identify whether there was any variation among their perceptions which could be linked to the specific characteristics of these five schools. The comparison of the sample of teachers of these five primary schools with the general sample of the Cypriot teachers, which is representative of its population, did not reveal any statistically significant difference. This seems to support the view in the previous section concerning perceptions of Cypriot teachers that there is a high consensus among Cypriot teachers about issues of curriculum reform in Mathematics.

The selection of these five schools was based on criteria which could help explore associations between perceptions and characteristics of schools (Chapter 4). At the first stage, I compared perceptions of teachers according to the school where they worked and irrespective of their special characteristics. Since the number of teachers in each school was relatively small, Kruskal Wallis one way analysis of variance and chi-square test were used to compare perceptions within the staff of these five schools. Two statistically significant differences were identified.

First, perceptions about the perceived importance of the purpose concerned with how pupils could solve problems varied according to the school where the teachers worked (K-W=13.84, p<.008). However, this difference can be attributed to different perceptions of teachers of schools A and D (both of which had a Head who is specialist in Mathematics) from all the others. Similar conclusions can be drawn for the second statistically significant difference which has to do with the extent to which their Head influenced their practice (K-W=24.12, p<.001).

A) Having Head who is a specialist in Mathematics

At the next stage, I decided to compare perceptions of teachers who had a Head who was a specialist in Mathematics (schools A and D) and those who did not. Kolmogorov Smirnov two sample test, t-test and chi square test revealed the following statistically significant differences. Their perceptions about the importance of the purposes concerned with how pupils can solve practical investigations (K-S Z = 1.41, p<.04) and how pupils could gain mathematical knowledge (K-S Z = 1.44, p<.03) varied according to the specialist interest of the Head of the school. The first of these differences provides an explanation for the statistically significant difference identified above (p. 237). It is also important to note that both of these differences are educationally significant since the cumulative frequencies about the former purpose of the group of teachers who had a specialist Head are smaller throughout than those who did not have a specialist in Mathematics Head and their cumulative frequencies about the latter purpose

are greater than those of teachers who did not have a specialist in Mathematics Head. This implies that teachers who had a specialist Head considered the former purpose as more important and the latter as less important than teachers who did not have a specialist in Mathematics Head.

Finally, there is a statistically significant difference between their responses on the extent to which they were influenced by their Head. Teachers who had a Head who had specialised in Mathematics were influenced to a higher extent by him than teachers who did not have a specialist in Mathematics Head ($t=5.93$, $df=47$, $p<.001$). This difference provides an explanation for the statistically significant difference between perceptions of teachers of these five schools concerning the same item. On the other hand, there was not any difference between the perceptions of these two groups about the extent to which they wanted Heads to influence them. This shows that the statistically significant difference between the influence which Heads who are specialist and those who are not had on practice had to do with the Head's subject expertise and not to different perceptions of these two groups about the Head's role and teachers' autonomy.

However, although teachers who had a Head who was specialist in Mathematics were influenced more by their Head than those who did not have specialist Head, the former group did not feel more confident in teaching Mathematics than the latter. This implies that the influence of a Head who was specialist in Mathematics was not able to contribute significantly to

teachers' professional development. This can be explained by the interview data (Chapter 6) and by documentary research (Appendix E) which show that there was no difference within the ethos of these five schools since there was no evidence indicating attempts to develop their own school policy or to organise any school based INSET. Teachers of these five schools worked in isolation. Thus, it was not possible to compare perceptions of teachers who worked in schools where there was a school policy and those who did not work in such schools since there was no school based curriculum development in these five schools (see Part E)

B) Well educated parents and high standards of pupils' achievement in Mathematics

The third comparison attempted was between teachers in schools who had well educated parents and high academic standards with teachers in schools who did not have either well educated parents or high academic standards. The Kolmogorov Smirnov two sample test and t-test did not reveal any statistically significant difference between perceptions of these two groups and this may be attributed to the fact that parents' influence on classroom practice was very limited. Thus, neither well-educated nor less well-educated parents influenced classroom practice and teachers did not want them to be able to influence their practice. This seems to reaffirm findings derived from the factor analysis about the limited effect of the "consumer" factor on practice in the general sample of Cypriot teachers.

However, the chi-square test revealed that there was a statistically significant difference between the teachers'

perceptions on whether their pupils know enough Mathematics to be able to assess themselves (X^2=9.50, df=2, p<.009). Table D.17, illustrating responses of teachers of these two groups of schools, shows that none of the teachers at schools which had high attaining pupils disagreed with that item and that 81.8% of them agreed with it. On the other hand, 34.2% of teachers of schools which did not have many high attaining pupils disagreed with this item and only 31.6% of them agreed with it. Thus, this difference is educationally significant and reflects perceived differences in their pupils' abilities in Mathematics rather than differences in the ideologies which these two groups supported. This finding seems to support my argument that the lack of high consensus among Cypriot teachers about this item may reflect differences among pupils' abilities in Mathematics.

C) Schools next to the "green line"

It was also possible to compare between perceptions of teachers who worked in schools which are next to the "green line" (separating the free from the occupied part of Cyprus) with perceptions of teachers who did not work in such schools. In this area, Turkish soldiers cause significant problems for people who wish to leave and so these schools have many pupils with special needs. This is partly due to facilities such as extra support teachers being less available in schools close to the Green line due to the situation prevailing in this area. Some of these children have disturbed backgrounds due to being the products of rape by the occupying forces.

Neither the Kolmogorov-Smirnov two sample test, nor the t-test or chi-square test revealed any statistically significant difference between their perceptions of curriculum reform in Mathematics. There was however a difference concerned with how confident they felt about teaching Mathematics (K-S $Z=1.36$, $p<.05$). The cumulative frequencies of the group of teachers who worked at schools which are next to the "green line" are greater throughout than those of teachers who did not work at such schools and this implies that teachers who worked at schools which are next to the "green line" did not feel as much confidence as those who did not work in such schools. This can be attributed to the fact that the former group had to teach Mathematics to more pupils who had special needs than other teachers and Cypriot teachers were not trained to do so. It is however educationally significant that teachers who worked in such schools did not organise their classrooms in such a way that their pupils spent more time in working on individual tasks than the pupils of other teachers (see Chapter 7).

D) School with the smallest class size versus school with the biggest class size.

It was finally possible to compare teachers who worked in the school which had classes with the smallest size with those who worked in the school which had classes with the biggest size. The Kolmogorov-Smirnov two sample test, t-test and chi-square test revealed the following statistically significant differences. First, teachers who worked in the school with the biggest class size considered unstructured observation as a less easy technique rather than teachers

who worked in the school with small class sizes (K-S Z=1.37, p<.047). A similar finding was revealed by comparing perceptions of the general sample of teachers according to the size of their class (Section 1.3 C.1). Similarly, the fact that teachers of the school with the biggest class size considered that having a smaller class size was a more important way of improving assessment than those of the school with the smallest class size (K-S Z = 1.92, p<.04) matches with figures derived from comparing perceptions of the general sample of Cypriot teachers according to the size of their class. However, a statistically significant difference was also identified between the way which these two groups of teachers organised their classroom. The t-test showed that teachers of the school with the biggest class size organised their classroom in such a way that pupils spent more time on collaborative tasks from those of the school with the smallest class size (t=-2.22, df=16, p<.041). This implies that teachers of this school considered working in group tasks as a manageable way for teaching Mathematics in classes of a big size.

E) Lack of School Based Curriculum Development

It can be now claimed that Cypriot teachers' perceptions did not alter dramatically according to the school where they had to work since there are very few differences between perceptions of the staff of one school compared with those of other schools. In addition, there was no difference between the general sample of Cypriot teachers and the sample of teachers of these five primary schools. In supporting this argument, it is important to mention that

though there was a high level of agreement among staffs of each school on perceptions about aims, the level of consensus was not higher among staffs of any of these schools compared to the others (Table D.18), since there was no school with relatively higher Kendall's coefficients of concordance for perceptions on aims from all the others. In addition, coefficients of the general sample are not much smaller than those of each school.

This finding was investigated further by using Ward's Clustering method among the sample of teachers of these five schools for their perceptions about classroom organisation (Item 31), about influences on practice (Item 33), and about influences on practice in an ideal case (Item 34). Although the chi-square test could not be used since more than 20% of the relevant cells have an expected frequency of less than 5% (Cochran 1954; Siegel 1956, p.178), Tables D.19, D.20, and D.21 show that teachers of a particular school did not belong to a particular group of the cluster solution. Despite methodological problems cluster analysis was also used for teachers' responses on ordinal variables by computing the Kendall's tau coefficient (Romesburg 1984, p.165). Table D.22 shows that SPSSX cluster procedures did not produce homogeneous groups formed from the staff of any one school in respect of perceptions of purposes of teaching and assessment in Mathematics.

This finding supports my argument that teachers' perceptions of curriculum reform in Mathematics were not associated with the school where they had to work and that explains why

there was no particularly higher level of consensus among staff of any of these five primary schools. This finding can be attributed to the fact that there is no school based curriculum development in any primary school of Cyprus, there is a lack of any school policy and the system in Cyprus is highly centralised. These are the main reasons for having relatively similar perceptions across the country but not particularly similar ones within the individual schools.

2.2 Perceptions of Cypriot teachers and Cypriot beginning teachers

This section is an attempt to identify differences in perceptions of curriculum reform in Mathematics between the randomly selected sample of 10% of Cypriot teachers and the group of beginning teachers. Both groups are representative of their population (see chapter 4) and as far as that of beginning teachers the sample comprised 82% of the whole population since questionnaires were administered to the whole group of beginning teachers. T-tests, Kolmogorov-Smirnov two sample tests, and chi-square tests revealed 13 statistically significant differences which are presented in Table 5.11.

We can observe from this table that beginning teachers were less confident in both teaching Mathematics and assessing their pupils' abilities in Mathematics. As a consequence, they considered further training as a more important way of improving assessment than the general sample of teachers. These findings can be also linked with the fact that beginning teachers were influenced more by their colleagues

Table 5.11 T-Values, and values of Kolmogorov-Smirnov two sample test derived from the comparison of perceptions of Cypriot beginning teachers with the randomly selected sample of Cypriot teachers.

Perception of Curriculum Reform	T Values	Degr of Freed.	p	K-S Z Values	p
Category 1: Perceptions associated with interval data					
1 Extent to which colleagues influence practice	3.83	283	.001		
2 Extent to which they want pupils to influence their practice	2.42	279	.016		
3 Extent to which they want inspectors to influence their practice	-2.45	280	.015		
4 Extent to which they want policy documents to influence their practice	-1.77	280	.078		
5 Pupils' Time spend on individual tasks	-2.38	278	.018		
6 Pupils' Time spend in working as a whole class	3.99	278	.001		
Category 2: Perceptions associated with ordinal data					
1 Confidence in teaching Mathematics				2.272	.001
2 Confidence in assessing pupils attainment in Maths				1.624	.01
3 Importance of further training in techinques of assessment for improving assessment				1.827	.003
4 Purpose of teaching Mathematics on how to gain knowledge				1.610	.011
5 There is a fixed sequence of Mathematical topics				1.415	.036
6 Assessment based on outcome rather than process				2.146	.001
7 Using the New Curriculum for carrying out their teaching				1.493	.001

than the general sample of Cypriot teachers. However, there was no statistically significant difference according to the extent to which these two groups were influenced by their heads.

There was a statistically significant difference between the perceptions of these two groups about item 37 concerned with pupils' self assessment (X^2=10.37, df=2, p<.006) which can be linked to the fact that beginning teachers were less confident in assessing their pupils than the general sample of Cypriot teachers. Table D.23 shows that more than half of beginning teachers were not able to say whether or not their pupils were able to assess themselves (54.1%) whereas one third of the randomly selected sample of Cypriot teachers (34.3%) were not able to say whether their pupils could assess themselves. Although the percentages of teachers of both groups who were not able to say whether their pupils could assess themselves or not were high, the fact that a higher percentage of beginning teachers did not know whether their pupils could assess themselves can be attributed to the fact that beginning teachers did not feel as much confidence in assessing their pupils' attainment in Mathematics as the general sample of Cypriot teachers. Thus, their doubts on whether their pupils know enough Mathematics to assess themselves may reflect their own inexperience in assessing their pupils.

Statistically significant differences were also identified between the perceptions of these two groups about four items which can be seen as related to progressive ideology.

Beginning teachers did not consider the purpose concerned with how children could gain Mathematical knowledge as important as the general sample of Cypriot teachers. In addition, more beginning teachers disagreed that there should be a fixed sequence of Mathematical topics to be taught and that assessment should be based on products rather than process. Finally, beginning teachers wanted pupils to influence them to a higher extent than that to which the general sample wanted pupils to influence them. These differences can be attributed to the likelihood that beginning teachers supported a more child-centred approach.

However, there was no statistically significant difference related to any of the five items concerned with active pedagogy (p. 212). *Thus, the t-test revealed that there was* no statistically significant difference between teachers' responses to the artificially constructed variable called "overall perceptions about active pedagogy" ($t=.16$, $df=254$, $p<.87$). In addition, their means are almost the same (3.93 and 3.92) and show that both groups of teachers agreed with the active pedagogy. This finding reaffirms the conclusion derived from Table 5.1 that there is a high consensus among Cypriot teachers' perceptions of active pedagogy.

T-tests revealed statistically significant differences between these two groups according to the way they organised their Mathematics classroom. Teachers of the randomly selected sample organised their Mathematics lessons in such a way that their pupils spent more of their time in individual tasks and less in working as a whole class than

beginning teachers. However, pupils of both groups spent more than half of their time in working as a whole class (means are 68% and 60%) and less than 20% on individual tasks (means are 15% and 18%).

Differences between the perceptions of these two groups can be also linked to the extent to which they felt various influences should affect their practice. Although beginning teachers felt less confident than the general sample of teachers, they wanted inspectors and policy documents to influence them to a lesser extent than the general sample of Cypriot teachers. This seems to be in line with the fact that fewer beginning teachers believed that the New Curriculum was useful for them to carry out their Mathematics lessons. These differences can be seen as a reflection of a different consideration of teachers' autonomy. It can be inferred that beginning teachers believed that teachers should not be influenced by the "political" factor to the same extent as the general sample of teachers, but believed that they should share experiences with their colleagues to a higher extent than the general sample of Cypriot teachers.

The statistically significant differences identified above were explored further by attempting to link them to the fact that perceptions varied according to teaching experience. This was due to the fact that most of the statistically significant differences identified in this section had to do with perceptions which vary according to experience (see section 1.3B). Thus, I decided to compare perceptions of

beginning teachers and perceptions of teachers with from 2 up to 5 years of experience. These groups had the same initial teacher training qualification and more or less similar teaching experience to beginning teachers since teachers of both groups can be considered as new teachers (Bullough 1989). T-tests, Kolmogorov-Smirnov two sample tests and chi-square tests revealed that there was no statistically significant difference between the perceptions of these two groups. Statistically significant differences were not identified even on how confident about teaching and assessment in Mathematics they felt. Thus, it can be claimed that the sample of beginning teachers is a typical sample of Cypriot teachers with less than 6 years of experience.

At the second stage I compared perceptions of beginning teachers with those of Cypriot teachers with 6 up to 10 years experience. T-tests, Kolmogorov-Smirnov two sample tests and chi-square tests did not reveal any statistically significant difference between the perceptions of these two groups. There was, however, a statistically significant difference on the extent to which they felt confident to teach Mathematics (K-S $Z=1.525$ $p<.019$). The fact that the cumulative frequencies of the group of beginning teachers are greater throughout than those of the group of teachers who had 6 up to 10 years of experience implies that beginning teachers were less confident about teaching Mathematics than teachers who had 6 up to 10 years of experience. Nevertheless, it is worth mentioning that no statistically significant difference was identified on how confident they felt about assessment in Mathematics.

Table 5.12 Statistically significant differences derived from comparing perceptions of: a) Teachers with up to 10 years of experience with those who had more than 10 years of experience and attended three years ITT program and b) Teachers with 2 up to 10 years of experience with those who had more than 10 years of experience and attended three years ITT program

No. Perceptions about	beginn up to 10 Vs. more than 10	2 up to 10 Vs. More than 10
1. Importance of gain basic knowledge	(K-S Z = 2.07, p<.001)	(K-S Z = 1.68, p<.007)
2. Assessment based on outcome than process	(K-S Z = 2.10, p<.001)	(K-S Z = 1.89, p<.002)
3. Further training in techniq. of assessment	(K-S Z = 1.53, p<.019)	No statis/ly signific.differen.
4. Pupils' time spend in working as a whole class	(t=3.31, df=210, p<.001)	(t=2.53, df=114, p<.013)
5. Pupils' time spend in working as a group	(t=-2.39, df=209, p<.018)	(t=-2.53, df=114, p<.013)
6. Extent to which they want inspectors to influence them	(t=-2.03, df=213, p<.04)	(t=-2.00, df=114, p<.05)
7. Documents used for planing their lessons	(X^2=17.44, df=3, p<.001)	(X^2=10.25, df=3, p<.016)

At the third stage beginning teachers' perceptions were compared with those of teachers who had more than 9 years of experience and less than 20. Statistically significant differences which emerged between beginning teachers and the sample of the whole group of teachers had mainly to do with the fact that these two groups were different in terms of the length of their experience. Thus, I decided to compare perceptions of teachers who had less than 10 years of experience, including the beginning teachers, with teachers who had more than 10 years of experience and attended the three years initial teachers' training program. Table 5.12 shows that the differences derived from comparing teachers who had more than 10 years of experience with teachers who had less than 10 years of experience and including the beginning teachers are almost the same as those derived from comparing the former group with teachers of the latter group but excluding beginning teachers. This implies that differences between perceptions of beginning teachers and perceptions of the general sample can be mainly attributed to the fact that their length of professional experience is different. Thus, we can infer that the data of this study are reliable and that the sample of beginning teachers is a typical sample of new teachers.

2.3 Perceptions of Cypriot beginning teachers and beginning teachers who graduated from the University of Warwick {BA(QTS)}.

This section illustrates a comparison of Cypriot beginning teachers with beginning teachers who work in England. It has been already argued that the educational systems in

England and Cyprus differ not so much in terms of models underlying the reform of schooling, as in the extent and nature of central control over the curriculum (see Chapter 3). It has also been shown, in a study concerned with student teachers' perceptions (Kyriakides 1992), that differences between perceptions of these two groups of beginning teachers when they were at the end of their training were primarily affected by the system within which their training was operating, rather than to differences in mathematical background, or specified pedagogy, or programmes of initial teacher training. This section investigates further this assumption and helps us to see how typical the Cypriot group of beginning teachers might be of other systems.

Items concerned with influence on practice and curriculum organisation were included in the questionnaire administered to beginning teachers at the end of their first year of experience. Thus, it was possible to identify some statistically significant differences which could not be identified when they were at the end of their training. Nevertheless, the hypothesis tested here is whether differences between their perceptions when they were at the end of their training and when they were at the end of their first year of experience relate to similar items and can therefore be attributed to differences of the two systems. Table 5.13 illustrates statistically significant differences between their perceptions when they were at the end of their initial training and when they were at the end of their

Table 5.13: Statistically significant differences between the perceptions of English and Cypriot beginning teachers when they were at the end of their training, and when they were at the end of their first year of teaching experience.

No. Perceptions	Warwick Vs Cypriot beginning teachers when they were at the End of ITT differ or not	End of first year of experience Values of relevant tests
1. Fixed sequence of topics	Yes*	K-S Z= 2.894 positive differ p<.0001
2. Fixed time of teaching	Yes	K-S Z= 2.693 positive differ p<.0001
3. Assessment of product	Yes	K-S Z= 1.811 positive differ p<.003
4. Othe Adult in the class	Yes	K-S Z= 4.049 negative differ p<.0001
5. Curriculum time in Maths	Yes	K-S Z= 1.966 positive differ p<.001
6 Time spend in working on individual tasks	N.A.**	X_1***= 14 X_2****= 54 p<.001
7. Time spend in working as a whole class	N.A.	X_1≈66 X_2= 20 p<.001
8. Appropriateness of written techniques	Yes	K-S Z=2.44, negative differ. p<.001
9. Ease of written techniques	Yes	K-S Z=2.75, positive differ. p<.001
10 Appropriateness of oral techniques	Yes	K-S Z=3.10, positive differ. p<.001
11 Ease of oral techniques	Yes	K-S Z=2.62, negative differ. p<.001
12 Confidence of assessment	No	K-S Z=2.25, positive differ. p<.001

No. Perceptions	Warwick Vs Cypriot beginning teachers when they were at the End of ITT differ or not	End of first year of experience Values of relevant tests		
13 Teach Maths mainly through Practical Investigations	No	K-S Z=1.75, positive differ.		p<.001
14 Influence of inspectors	N.A.	X_1=3.61	X_2= 2.83	p<.001
15 Influence of documents	N.A.	X_1=3.78	X_2= 3.12	p<.001
16 They want inspectors to be able to influence them	N.A.	X_1=3.50	X_2= 3.08	p<.001
17 They want policy documents to influence them	N.A.	X_1=3.88	X_2=2.86	p<.001
18 The manageability of the National Curriculum	N.A.			

* Yes : Statistically significant difference at lower than .05 level
** N.A. : Item not included at the questionnaire administered to them when they were at the end of their ITT programme.
*** Average of Cypriot beginning teachers
****Average of English Beginning teachers

first year of experience. The following three observations arise from Table 5.13.

First, statistically significant differences identified between perceptions of Warwick and Cypriot beginning teachers when they were at the end of their first year of experience are concerned with items for which these two groups of beginning teachers had different perceptions when they were at the end of their training. However, differences in their perceptions of techniques of assessment are presented here in a summary form by comparing their perceptions about the category of written techniques and that of the oral techniques. The category of written techniques was seen as more appropriate (K-S $Z=2.44$, $p<.001$) and as less easy (K-S $Z=2.75$, $p<.001$) by Cypriot than Warwick beginning teachers when they were at the end of their first year of teaching experience. On the other hand, oral techniques were seen as less appropriate (K-S $Z=3.10$, $p<.001$) and as more easy (K-S $Z=2.62$, $p<.001$) by Cypriot rather than Warwick beginning teachers when they were at the end of their first year of experience. However, the oral category was not a coherent one among Cypriot beginning teachers' perceptions when they were at the end of their first year of experience ("Absolute ranks" of appropriateness=1, 2, 3, and 8; "Absolute ranks" of ease=1, 2, 6, and 8). This finding matches that emerging from Table 5.2 presenting perceptions of the general sample of Cypriot teachers (see p. 179).

Second, two statistically significant differences were identified between the perceptions of these two groups when they were at the end of their first year of teaching experience which were not identified when they were at the end of their training. The first one had to do with how confident they felt about assessment in Mathematics (K-S Z= 2.25, p<.001). The cumulative frequencies of Cypriot beginning teachers are smaller throughout than those of Warwick beginning teachers. This implies that Cypriot beginning teachers felt more confident in assessment of Mathematics than Warwick beginning teachers. The fact that there was no difference in how confident they felt about teaching Mathematics implies that the above difference has nothing to do with subject difficulties but is due to difficulties from attempting to implement assessment policy in England. This finding is discussed further in Chapter 7 taking into account that such a difference was not identified when they were at the end of their training. The other difference had to do with their perceptions about the idea that Mathematics should be taught mainly through practical investigations (K-S Z=1.75, p<.001). Table D.24 shows Cypriot and Warwick beginning teachers' perceptions about that item. We can observe that most of the Cypriot teachers (79.8%) agreed with that item and only four of them disagreed (4%). On the other hand there is a variation among Warwick teachers' perceptions and only 48.8% agreed with that item.

Third, there were some further statistically significant differences between Warwick and Cypriot teachers which had

to do with items about classroom organisation and influences on practice. The differences on curriculum organisation show that Warwick beginning teachers organised their classes so that their pupils spent most of their time in working on individual tasks (mean=54) in contrast with those in Cyprus who organised their classes so that their pupils spent most of their time in working as a class (mean=68.5). However, neither Warwick nor Cypriot beginning teachers distributed their teaching time in Mathematics equally among the three ways of classroom organisation. In addition, Table D.25 and Table D.26 which illustrate the percentage of time which pupils of four homogeneous group of Warwick and Cypriot beginning teachers, respectively, spent in these three ways of classroom organisation show that none of these groups distributed its teaching time equally among these three ways of classroom organisation. These groups were produced by using the Cluster Analysis procedure of SPSSX.

Differences in influences on practice can be clearly attributed to the essential difference between the English and Cypriot educational systems. Cypriot beginning teachers were influenced to a higher extent by inspectors and policy documents than Warwick beginning teachers. Similarly, Cypriot beginning teachers wanted these two factors to influence them to a higher extent than Warwick beginning teachers. However, schemes were used for planning Mathematics lessons by more than half of both groups rather than their national curriculum or other non-statutory guidelines.

Finally, most of the Warwick beginning teachers (71.7%) considered the requirements of National Curriculum in Mathematics as manageable whereas very few Cypriot beginning teachers (21.8%) considered the requirements of the New Curriculum as manageable. However, this difference can not be explained easily since the two curricula are not similar. Nevertheless, there is a need for the Ministry of Education to reconsider the content of the New Curriculum since both beginning teachers and the general sample of Cypriot teachers agreed that its requirements are not manageable.

It should be, finally, acknowledged that the sample of graduates from Warwick is of uncertain representativeness nationally. Thus, figures about the perceptions of Warwick graduates, mentioned here, can not be used to draw conclusions about perceptions of English beginning teachers as a whole since further research is needed to explore the national picture. Therefore, figures about their perceptions on the manageability of the National Curriculum in Mathematics do not represent perceptions of all English beginning teachers.

It can be, however, inferred that the statistically significant differences between Cypriot and Warwick beginning teachers' perceptions when they were at the end of their first year of experience were primarily affected by the system within which their teaching is operating and that a similar conclusion to that made by comparing their perceptions when they were at the end of their training can be drawn. The next section explores this argument further.

2.4 Perceptions of beginning teachers at the end of their training and at the end of their first year of experience.

a) Cyprus

It was possible to compare perceptions of Cypriot beginning teachers when they were at the end of their training and when they were at the end of their first year of teaching experience by using data gathered from my previous study (Kyriakides 1992). It has been already mentioned that the two questionnaires were not exactly the same and the comparison of beginning teachers' perceptions at these two stages of their professional life concerned with only perceptions of aims, methods of teaching and assessment in Mathematics, and ways of improving assessment which were measured by items 11-26, 35 and 36 of the questionnaire (Appendix B).

Although it was not possible to identify those beginning teachers who answered the questionnaire twice since the questionnaires were answered anonymously, the fact that I had a very high response in both cases (76% and 82% respectively) and the questionnaires were administered to the whole population implies that figures derived from each sample can be used for generalisation to its population. In addition, even if we assume that all the beginning teachers who did not respond the first time decided to respond the second time (ie 24%) then a very high percentage of beginning teachers (58%) had responded to the questionnaire twice. Finally, it has been shown in Chapter 4 that there is no statistically significant difference between the

characteristics of the respondents to the questionnaire in these two cases. It can be therefore claimed that this comparison measures changes in perceptions of Cypriot beginning teachers.

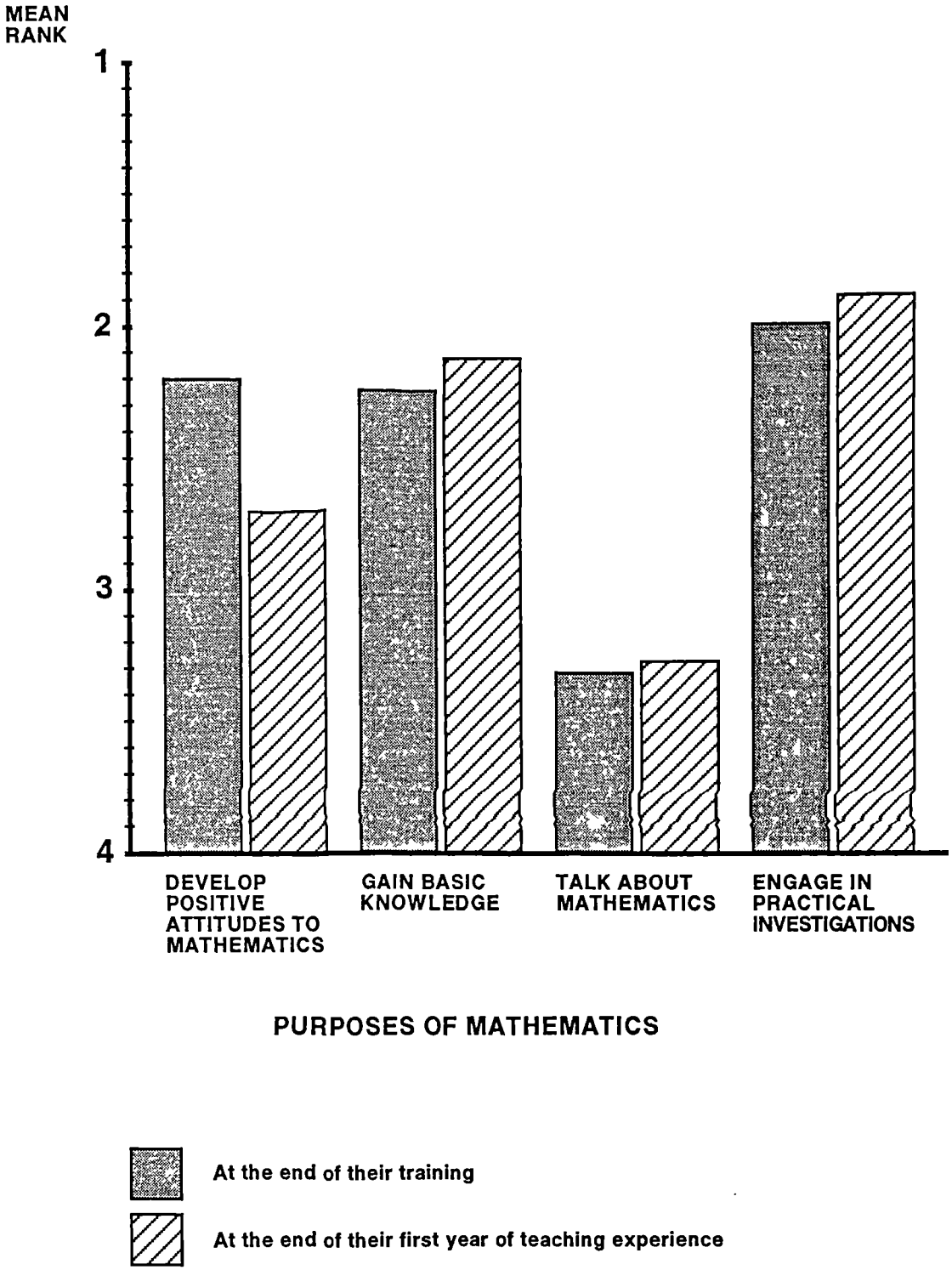
The Kolmogorov-Smirnov two sample test was the test used for these comparisons since all the perceptions which could be compared were concerned with ordinal data. The following three statistically significant differences derived from this comparison. First, beginning teachers considered interviews as a less easy technique of assessment when they were at the end of their first year of teaching experience than when they were at the end of their training (K-S $Z=1.432$, $p<.033$). Since they did not feel more confident in assessing Mathematics at the end of their first year of teaching experience than when they were at the end of their training, it can be inferred they realised from their teaching experience how difficult it is to use this technique of assessment. This finding is also in line with the fact that beginning teachers considered the category of oral techniques as less easy when they were at the end of their first year of teaching experience than when they were at the end of their training (K-S $Z=1.445$, $p<.031$). These two statistically significant differences are educationally significant since in both cases the cumulative frequencies of beginning teachers when they were at the end of their training are greater throughout than those of beginning teachers when they were at the end of their first year of experience. This implies that they considered these techniques as less easy when they were at the end of their

first year of experience than when they were at the end of their training.

However, there was no statistically significant difference according to the perceived appropriateness of these techniques. It can be therefore claimed that there was no change in the educational ideology about techniques of assessment which beginning teachers supported when they were at the end of their training and when they were at the end of their first year of teaching experience. Differences on the perceived ease of techniques of assessment have to do with the fact that they have realised that oral techniques are not as easy as they thought when they were student teachers.

In supporting my argument that their educational ideology had not dramatically changed, it is worth mentioning that there is only one statistically significant difference between their perceptions of teaching and assessment in Mathematics at these two stages of their professional life. This difference was concerned with the perceived importance of the purposes of Mathematics. Graph 7 shows beginning teachers' perceptions of purposes of Mathematics at the end of their training and at the end of their first year of teaching experience. The assumptions and shape of this graph is similar to Graph 1. In addition, Kendall's coefficient of concordance and a test of its significance based on the Fisher's Z-distribution (end note 1) show that beginning teachers agreed among themselves in their ranking of the relative importance of these purposes when they were at the

GRAPH 7: CYPRIOT BEGINNING TEACHERS PERCEPTIONS OF PURPOSES OF MATHEMATICS WHEN THEY WERE AT THE END OF THEIR TRAINING AND AT THE END OF THEIR FIRST YEAR OF TEACHING EXPERIENCE



end of their training (W=.19, Z=1.410, V_1=2.97, V_2=223 and p<.001) and agreed among themselves when they were at the end of their first year of experience (W=.23, Z=1.69, V_1=2.98, V_2=289 and p<.001).

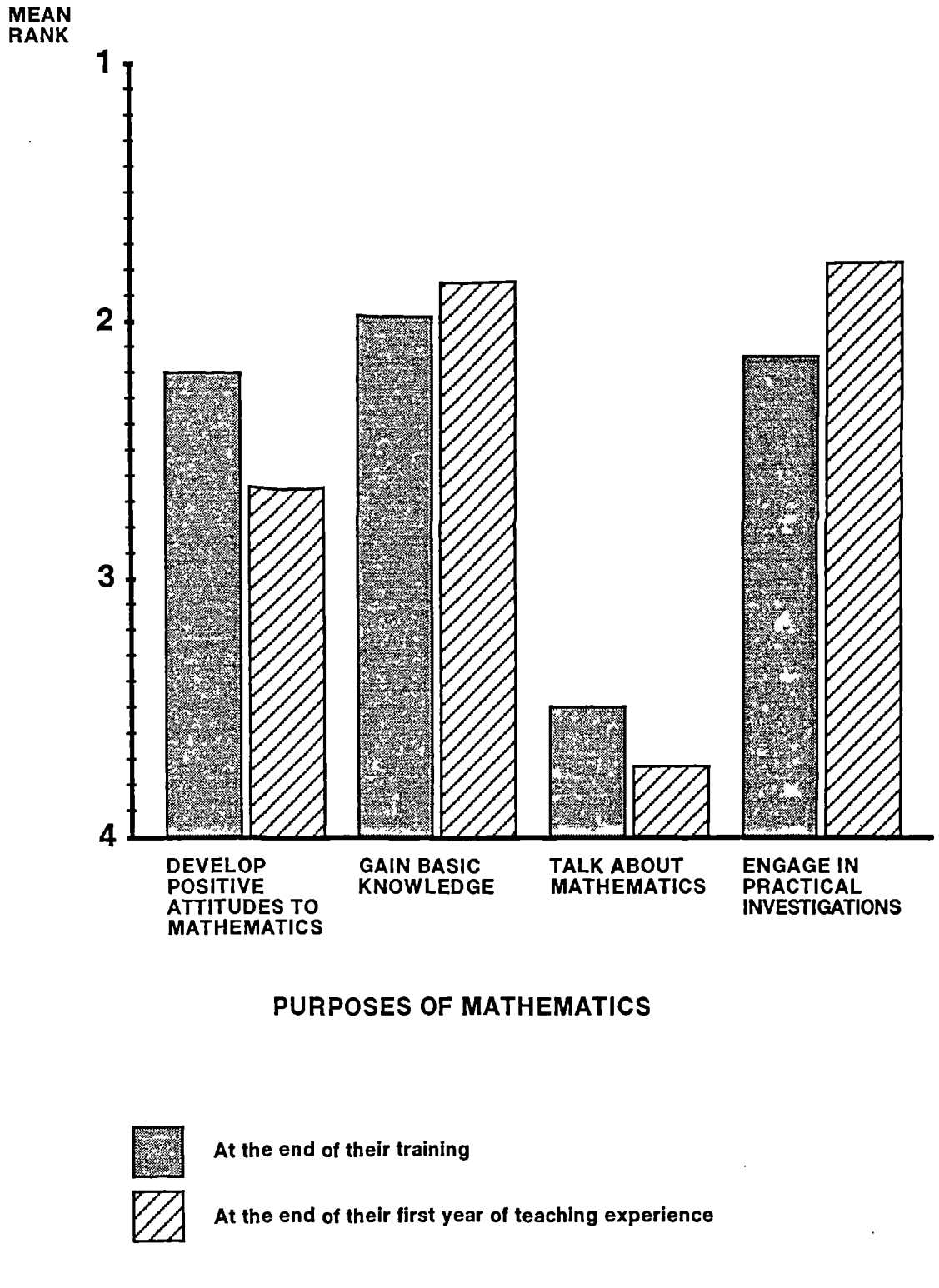
We can now observe that beginning teachers when they were at the end of their first year of teaching experience did not rate the various purposes (the purpose concerned with the development of positive attitudes to Mathematics, the one concerned with how children could gain knowledge and the one concerned with how children could solve practical investigations) in the same order as when they were at the end of their training. Thus, beginning teachers when they were at the end of their first year of experience considered the purposes concerned with gaining knowledge and with solving practical problems as the most important purposes whereas the purpose concerned with the development of positive attitudes to Mathematics was the next most important. When they were at the end of their training they considered these three purposes as equally important. There is, however, only one statistically significant difference between their perceptions on aims and this is related to the purpose concerned with the development of positive attitudes to Mathematics (K-S Z= 1.35, p<.05). It can be therefore claimed that although they had not changed their perceptions about active pedagogy, they considered teaching Mathematics as less about developing positive attitudes to Mathematics than when they were student teachers. This may imply that beginning teachers became less keen about progressive

ideology. This is a finding also in respect of changes of Warwick beginning teachers' perceptions presented below.

b) Graduates of Warwick University {BA(QTS)}

Statistically significant differences between Warwick beginning teachers when they were at the end of their training and when they were at the end of their first year of experience are concerned with perceptions of purposes of teaching Mathematics. The Kolmogorov Smirnov two sample test shows that Warwick beginning teachers at the end of their first year of experience considered the purpose concerned with positive attitudes to Mathematics as less important (K-S $Z= 2.285$, $p<.001$) and those concerned with how children could gain knowledge (K-S $Z= 1.38$, $p<.05$) and solve problems (K-S $Z= 1.68$, $p<.007$) as more important rather than when they were at the end of their training. Thus, Graph 8, presenting Warwick beginning teachers' perceptions of purposes of Mathematics, shows that they considered these three purposes as equally important when they were at the end of their training whereas when they were at the end of their first year of experience they considered those concerned with how children could gain knowledge and how children could solve practical investigations as the most important and that concerned with the development of positive attitudes as the next most important. This is a similar finding to that for Cypriot beginning teachers. It can be therefore claimed that similar changes in beginning teachers' perceptions of teaching and assessment in Mathematics have been identified among both Cypriot and Warwick beginning teachers. The only difference which has

GRAPH 8: ENGLISH BEGINNING TEACHERS PERCEPTIONS OF PURPOSES OF MATHEMATICS WHEN THEY WERE AT THE END OF THEIR TRAINING AND AT THE END OF THEIR FIRST YEAR OF TEACHING EXPERIENCE



not been identified among Warwick beginning teachers concerned the difficulties of assessment and has nothing to do with changes on the educational ideology they supported. This implies that changes in perceptions of Cypriot beginning teachers were similar to those identified among a sample of beginning teachers in a less centralised system.

Summary

The first section of this chapter presents evidence concerned with the first objective of this research which has to do with Cypriot teachers' perceptions of curriculum reform in Mathematics in primary schools of Cyprus. The relation of the findings about Cypriot teachers' perceptions with the main policy initiatives, outlined in chapter 2, will be discussed in Chapter 7.

The second objective of this research concerned the professional and political influences upon teachers' perceptions was also examined in this chapter by investigating statistically significant differences between the perceptions of the four samples and within them (Sections 1.3 and 2). Only three null hypothesis of those presented in Chapter 1 were accepted and showing that there was no statistically significant difference between perceptions of curriculum reform in Mathematics among the following groups:

a) Cypriot teachers who attended specialised courses (at either ITT or INSET level) in Mathematics with those who had not attended

b) Cypriot teachers who had attended the compulsory INSET course called Epimorfoses and those who had not. (These two groups had the same ITT qualification and less than 10 years teaching experience).
c) The randomly selected sample of 10% of Cypriot teachers with the sample of Cypriot teachers who work at five large primary schools in Cyprus.

It can be, therefore, argued that perceptions of Cypriot teachers were not influenced by INSET but by the following political and professional factors: length of teaching experience, initial teacher training, the characteristics of the classes they have to teach (eg class size, year group of pupils, number of different year groups), and the extent to which the centre exercises control at the local level. It was also found that there was a high consensus among the sample of 10% of Cypriot teachers, but the level of consensus was not higher among the staff of any of the five schools compared with the others. The lack of any school based curriculum policy (see Chapter 6, and Appendix E) and the fact that the system in Cyprus is highly centralised are the main reasons for having relatively similar perceptions across the country but not particularly similar across the individual schools.

The last chapter deals with the third objective of this research (Chapter 1). Thus, implications of these findings for improving reform policy in Cyprus are discussed. A new model of change is developed by taking into account teachers' perceptions and the factors influenced them.

END NOTES

[1] The testing of the significance of the observed value of W can be done according to Kendall (1970, p.98) using an approximation which is based on the Fisher's Z-distribution. We write $Z=(1/2)\ln[(m-1)W/(1-W)]$, $V_1=n-1-(2/m)$ and $V_2=(m-1)V_1$ where n is the number of entities to be ranked and m is the number of judges assigning ranks. Then, for "degree of freedom" V_1 and V_2, Z may be tested in the existing tables of Fisher's distribution (Fisher 1974, pp 52-56). The significant value of W can be interpreted according to Siegel (1956, p. 237) as meaning that "the observers or judges are applying essentially the same standard in ranking the N objects under study". However, if the number of entities to be ranked is larger than 7 (as in the case of the techniques of assessment), the significance of the value of 'W' can be tested by using a formula which is approximately distributed as chi-square and has been mentioned.

[2] The Ward method is a very general hierarchical clustering method based on the Ward algorithm (Ward 1963, Ward and Hook 1963). Romesburg (1984, p. 129) argues that "after UPGMA, Ward's minimum variance clustering method is the most often used." Like the other clustering methods, it follows a series of steps that begin with *t*-clusters each containing one of the *t* data units and it ends with one cluster containing all the data units. At each step it makes whichever merger that results in the minimum increase of E, called the sum of squares index, or variance. E is computed as follows: First, we calculate the mean of each cluster. Second, we compute the differences between each object and its cluster mean. These differences could be positive or negative. Thus, at the third stage we square each of these

differences. Then we add these for each cluster, giving a sum-of-squares value for each cluster. We finally compute the value of E by adding these sum-of-square values for all the clusters.

Thus, at the first stage the membership and the mean of each cluster coincide so that E=0 for all clusters. At the next stage those two clusters whose merger gives the minimum increase in the total within group error sum of squares E are chosen and produced a new cluster. Then we have to update entries in the similarity matrix and repeat the previous stage. Thus, the algorithm operates directly on the similarity matrix which is just an array of numbers. However, since the clustering index E is a function of the squares of the attribute differences, and since the attribute differences increase as more objects are forced into clusters as the method progresses, it follows that E increases non linearly as we work up through the clustering steps. Thus, dendrograms computed with Ward's clustering method have "a well-defined look in which clusters usually jump out at the eye" (Romesburg, 1984, p. 134). This is a characteristic of this method which makes it popular among researchers. It should be finally mentioned that Ward's clustering method is explained Mathematically by Anderberg (1973, p. 142).

[3] Anderson (1958) defines principal components as:

> "linear combinations of random or statistical variables which have special properties in terms of variances. For example, the first principal component is the normalised linear combination (that is, the sum of squares of the coefficients being one) with maximum variance" (p. 272).

Given that the first principal component accounts for the largest variance, the second principal component should

account for the next largest variance and it should be uncorrelated with the first. Successive components explain progressively smaller proportions of the variance and are uncorrelated with each other. Thus, the method of principal components is used to find the linear combinations with large variance. And since in many exploratory studies the number of variables under consideration is too large to handle, a way of reducing the number of variables to be treated is to discard the linear combinations which have small variances (in this study those which are smaller than 1 unit) and study only those with large variances. Thus, the principal components give a new set of linearly combined measurements which is easily handled. Hotelling (1933), who developed many of these ideas, illustrates the procedure of principal components mathematically. This method can be also used to explain the correlations between these variables as arising from the sharing of common factors among them.

CHAPTER 6: REPORT AND ANALYSIS OF QUALITATIVE DATA

Introduction: Structure of Analysis

In carrying out the interviews with 10 beginning teachers and 10 teachers of five relatively large primary schools, I had the following two objectives. The first objective was to examine the validity of the research findings, by matching the data derived from the interview with each teacher against his/her individual responses to the questionnaire. Thus, the first section of this chapter presents the findings derived from using the triangulation method, in order to examine the validity of the research. Interviews with 10 teachers of the five primary schools were also used to find out whether any school policy had developed in these schools. The second section is therefore concerned with the views of these 10 teachers about the development of a school policy in their schools and provides evidence supplementary to the questionnaire data. These supplementary data will help to explore quantitative data, dealing with differences in perceptions of teachers across and within these schools.

Since the interview data were mainly used in order to compare and complement the questionnaire evidence, I decided to use a semi-structured interview schedule. The analysis of these data will therefore be based on the structure of the interview schedule, which can be seen in Appendix C.1. This structure was for the most part constructed around the main dependent variables of the questionnaire (Part B), with one further element added. This was the development of school-

based policies and was concerned with the second purpose of conducting interview.

1) Using Interview data for Triangulation with questionnaire evidence

A comparison between data derived from semi-structured interviews with 20 teachers and their own responses to the questionnaire is provided in this section. Interview data will be used to compare teachers' responses to some items of the questionnaire and to assist in interpreting them. The presentation of this comparison is divided into six parts; the first five of which represent responses to the five open-ended questions of the interview.

1.1) Purposes of Mathematics in Primary school

In response to the first open-ended question on the purpose of Mathematics in primary school, all the teachers considered the development of children's mathematical thinking as the general aim. The provision of opportunities for children to gain basic mathematical knowledge, to solve day-to-day problems and practical investigations and to develop positive attitudes to Mathematics, were also seen by all as important purposes of teaching Mathematics. The interviews therefore suggested the same ideas about purposes of Mathematics, as in the questionnaire answer. This can be seen in terms of the following three issues. First, even though these 20 teachers were not asked to rank the four purposes illustrated in the questionnaire, according to their importance, 12 out of 20, expressed preferences,

matched to their responses to the questionnaire. The following comments (my translation) of three of these teachers, illustrate this match between quantitative and qualitative data.

a) "I think that it is more important to help your children to solve problems and engage with investigative tasks rather than to gain knowledge. Thus the most important purpose of teaching Mathematics is to enable them to solve problems. The next most important is to help them to gain knowledge. Children should be able to think mathematically and due to that, they will learn the basic mathematical concepts like the operations. The next most important purpose is to develop positive attitudes to Mathematics and this will be achieved as soon as the children learn how to think Mathematically." {Beginning teacher 1 ranked purposes of item 13 as following: 13d (The most important), 13b, 13c, and 13a(The least important)}

b) "Although it is not easy to identify the most important purposes of teaching Mathematics, I believe that you should concentrate your efforts on how to enable your children to solve problems which they face or they will have to face in their life. Teaching Mathematics should not only be based on how to help children to find out how many 20+20 or 12+13 is ... you know operations and knowledge only. However, you should also help them to gain knowledge but this purpose should be seen as the second most important purpose. After that you can speak about other purposes which are less important like that of developing positive attitudes to mathematics." (Teacher C.2 ranked purposes of item 13 as following: 13d, 13b, 13c, and 13a)

c) I believe that you have to concentrate on the knowledge and the purpose concerned with knowledge should be seen as the most important purpose. Then, you should help them to develop positive attitudes to Mathematics. If you achieve this, they will easily learn any Mathematical concept. Although it is not easy to say which is the most important purpose, the fact that at the end of the day children should know all these concepts, implies that the most important purpose is to enable them to gain knowledge. The third most important purpose is to help them to engage with practical investigations but this will be achieved after they learn the concepts"(Beginning Teacher 4 ranked purposes of item 13 as following: 13b, 13c, 13d and 13a)

Second, this match between quantitative and qualitative data can be also seen in the teachers' comments that they had never thought about the role of talk in the teaching of Mathematics. This is in line with the fact that this purpose was ranked by all of them as the least important purpose.

Third, the correlation between teachers' perceptions of purposes of Mathematics and methods of teaching Mathematics, found by teachers' responses to the questionnaire, also found in the interview responses of these 20 teachers. This was especially true for the purposes concerned with the development of positive attitudes to Mathematics and with solving practical investigations. Teachers who considered the development of positive attitudes as either the most or the next most important purpose of Mathematics, linked it with teaching Mathematics in an enjoyable way, by using games and making children to believe that they can achieve the aims of each topic. Those who considered the purpose concerned with solving practical investigations as the most important purpose, mentioned that this purposes is promoted by practical and experimental teaching activities rather than context free Mathematical tasks, asking children to calculate meaningless things.

Teachers' responses to this open-ended question, revealed that at least 16 of them supported a view of the utilitarian nature of mathematics. They linked the purposes which they considered as the most important with the day-to-day problems which children have to face and will have to face

in their future life. A typical example presenting this link is the following quotation.

> "The mathematical knowledge which should be provided to the children should be useful for their future lives. They should be able to use them to solve day-to-day problems and see that Mathematics is useful and can help them to make their lives better." (beginning teacher 5)

A connection of teaching Mathematics with shopping and the market was used by some of them as a way to illustrate their opinion that Mathematics was useful for pupils' lives. And although teachers' perceptions about the nature of mathematics were not explored by the quantitative data, it can be argued that a utilitarian concept of the nature of Mathematics was supported by these 20 Cypriot teachers.

1.2) Purposes of Assessment

The interview data on the perceptions of these 20 teachers about the purposes of assessment were identical to the questionnaire responses. First, the teachers had ranked the formative purpose as the most important purpose of assessment in the questionnaire, and in the interview also, formative purposes were considered as the most important. Assessment was also seen by them as having a diagnostic function. For example, teacher E.1 commented that "assessment is a way to find out what children have learned in order to adjust my next lesson plan to their abilities". Second, the 16 teachers who ranked teachers' self-assessment as the next most important purpose in their responses to the questionnaire provided an interesting connection between

formative purpose and teachers' self-assessment. The following comments echoes this view:

> "The assessment is mainly for the teacher. It should help him to identify first of all his pupils' abilities, you know, what they know and what they do not know. This will help him to organise his next lesson and provides pupils the most appropriate tasks. This is the most important reason for trying to assess my pupils. It is also important to go and assess yourself on the basis of these results. With that I mean to go and see whether your methods were the most appropriate and whether you have to change them in order to help your pupils to learn easier. You can see that these two purposes are interrelated"(Teacher B.1).

Assessment for formative purposes and for self-assessment was seen by 16 of these teachers, as the most important purposes and as strongly inter-connected, according to their responses to interviews. This was a finding in the quantitative data on the general sample of Cypriot teachers (p.169).

Third, the interview evidence of twelve of the teachers suggests that there was match between quantitative and qualitative data in respect of summative assessment. Nine of the 12 teachers who ranked summative assessment as the least important purpose, also disagreed with it as a purpose for assessment. The following comment demonstrates this view:

> "I can not see any reason why I should compare my pupils. I am only interested on finding out what my pupils know. I also disagree with comparing the results of classes of the same school. We have two year 1 classes in our school. Three weeks ago, we decided to change classes and I taught similar things to the other class. I found out that the pupils of this class managed to do the teaching tasks which I offered them quickly and successfully ... There are so many factors which you have to take into account when you try to compare among classes or pupils which makes this

comparison meaningless. That is why I do not agree with this comparison." (beginning teacher 8)

Three of those who had ranked summative assessment as the least important purpose, disagreed with the idea of comparing pupils within each class, but accepted the idea of comparing classes or schools. These teachers' perceptions about the idea of using assessment results for comparison was differentiated according to the unit of comparison and this distinction emerged in interview only.

Fifth, the five teachers who had ranked summative assessment as the second least important purpose in their responses to the questionnaire, did not express any disagreement with summative purposes in the interview. Two of them took the view that comparison provided motivation to pupils. However, they made explicit that they did not see this as important as formative purpose or teachers' self-assessment.

One teacher ranked summative assessment as the second most important and her comments revealed a match between her response to item 14 of the questionnaire and to the second open question of the interview.

"Assessment is first of all concerned with teachers' attempt to find out what their pupils know and what activities we should provide them. Then assessment has to do with the pupils. I think that pupils who study hard, expect a positive motivation, like teacher's comments that they have done well or that they did not make many mistakes. When I mark their exercises and write "very good", I can see how happy they are. That is why I agree with comparing not only pupils but also classes. Comparison between classes provides satisfaction to teachers who work hard" (Teacher D.1)

1.3) Teaching Mathematics in Primary School

The following section deals with the "good practice" in teaching Mathematics. Eight areas of teaching Mathematics derived from comparing the quantitative with the qualitative data are discussed in this section.

First, the effectiveness of practical activities was widespread among the comments of these 20 teachers. In addition, thirteen teachers supported the idea that practical tasks should be provided to pupils irrespective of their age or ability. However, five teachers believed that they were more useful for younger pupils, since the older pupils should be able to deal with the abstract way of teaching which they would meet in the secondary schools. A comparison between responses of each of the above 18 teachers to questionnaire and interview revealed common data, irrespective of whether they agreed with the item 18 or not. The following comments show how the comparison between quantitative and qualitative data for these two groups was attempted.

a) "I think that practical activities are equally appropriate for both pupils of Cycle A and Cycle B. For instance, pupils of Cycle B may construct solids when they are taught Geometry. However, practical tasks for teaching Mathematics in Cyprus are mainly provided by teachers of Year 1 or 2. Similarly, I agree that practical activities offer motivation to low attainer pupils to deal with teaching mathematics, but this does not mean that they are not useful for high attainers." (Beginning teacher 10 agreed with items 18 and 19)

b) "Practical activities are useful. For instance if we refer to the length, width, or area of a shape children should have the opportunity to see and measure them in order to understand what they are. However, I believe that younger pupils need more practical activities than

> older. Even if they are necessary for both groups of pupils, older should learn how to deal with abstract mathematical concepts since they will be taught in this way when they go to secondary schools." (Teacher A1 agreed with item 18 and disagree with item 19)

Second, the 20 teachers who were interviewed, agreed that children should have direct experience of using Mathematics in a wide range of contexts across the curriculum (the item 22) and the comments of 12 of them, in response to my third open question revealed that they did not only agree with that, but considered it as an important teaching approach in Mathematics. The following quotation provides a typical example of agreement between quantitative and qualitative data and examples of using cross-curricular approaches for teaching Mathematics.

> "I think that we should try to link teaching mathematics with other subjects, you know, we should use the cross-curricular approach for teaching Mathematics. For instance, today I had to teach the use of the terms **first, second, third** etc in the Language lesson and I linked that with Maths. Three days ago our reading was associated with the time and the clock. This was also linked to Maths. I also remembered that a week ago we attempted to make similar shapes in art and I taught them some basic things from symmetry, in order to be able to do that." (Beginning teacher 3 agreed with item 22)

Third, 16 of them had agreed with item 25 of the questionnaire that Mathematics should be taught mainly through investigations. This approach was seen in the interview as an effective method of teaching Mathematics by 12 of these 16 teachers. The other four teachers did not raise any relevant comment when they were interviewed. Although teachers considered this approach as very effective, they also acknowledged that it was difficult to

put it in practice, since it required more teaching time to cover a topic. This perception is illustrated below:

> "I am absolutely sure that teaching Mathematics mainly through investigations is an ideal approach to teaching Mathematics. This approach is however time-consuming. As a consequence, any teacher should take this into account before she decides to adopt this approach especially when she believes, like me, that the content of the curriculum can not be easily completed by her pupils." (Teacher A.2)

Fourth, six of them said in the interview that the timetable in primary schools, should be characterised by flexibility and that it should not be necessary to have the same time for Mathematics every week. These six teachers had disagreed with item 21 that it was necessary to do Mathematics at a fixed time every day. Although they suggested that the teaching time for Mathematics should be dependent on the children's interest and the kind of specific topic activities which a lesson might include, none of them considered the timetable as unnecessary. This perception is very precisely described by the following example given by Teacher E2:

> "If the lesson is organised in such a way that pupils should measure a specific area of the garden to help children understand a relevant concept, then this lesson might take place in a convenient time. Otherwise teaching Mathematics during the morning hours is better, when the children can learn easily".

The other 14 teachers did not mention anything related to this item. It may be concluded that the fact that more than half of them did not raise that issue, suggests that they did not consider it as a significant issue of teaching Mathematics.

Fifth, the issue of a pre-specified sequence of Mathematical topics (item 15) is particularly problematic since only 10 teachers raised it in the interview. In addition, there was agreement between the questionnaire and interview responses of eight teachers but not for two others. The following two quotations are typical of the group of teachers who responded similarly to the two methods and of the two teachers who did not provide similar responses.

a) "Obviously some topics should be taught before others, but at the same time some other topics can be taught together, like the fractions which can be linked with both "percentages" or "proportions". Thus, as soon as you have covered fractions, you can then teach either of these two topics. I think that teachers should have the opportunity to choose how to link Mathematical topics and they can do that on the basis of their pupils' interest or by taking into account what has to be taught in other subjects. I should, however, say that inspectors, at least those who are broad minded, do not ask their teachers to follow the sequence of topics which is followed in the books. There are however inspectors who may come and tell you why you have been moved to multiplication without teaching subtraction first" (Teacher C.1 disagree with item 15 suggesting that there is a fixed sequence of topics)

b) "I think that Mathematics is a hierarchical subject and that inspectors should make explicit to teachers the most appropriate sequence of topics which they are supposed to follow. Teachers, nowadays, do not know which is the sequence which they are supposed to follow. (However Teacher B.1 disagreed with item 15)

Although two teachers did not respond similarly to the questionnaire and interview, teachers' responses to both interview and questionnaire revealed that there was no overall agreement among teachers about this item. Thus, this mismatch between responses of these two teachers may reflect an uncertainty about this item. This uncertainty can be attributed to a policy confusion.

Thus, 6 teachers believed that they were supposed to follow a pre-specified sequence of Mathematical topics, whereas 5 believed that they were not. Those who suggested that Cypriot teachers are required to follow such sequence attributed it to either the strong effect of textbooks or to inspectors' requirement to cover certain topics at a specific time. For instance Beginning Teacher 5 said that:

> "If I try to follow a different sequence from that of the textbook then I will have problems with parents who are going to ask me why pupils of the X school are doing this topic and you are doing that. In addition, pupils might get confused since they will have to move from one page of the book to the other, instead of following an order"

Those who mentioned that they were "in theory, free" to follow any sequence of Mathematical topics, indicated also that this was so, because they had broad-minded inspectors who left them to choose any sequence of topics. It can be, therefore, argued that teachers did not know whether they were supposed to follow this sequence and this suggests confusion in the application of policy by inspectors. The latter point may explain why Cypriot teachers did not have a coherent view about this topic and why two of them responded differently to interview and questionnaire. It should, however, be acknowledged that the latter mismatch may have to do with the fact that 100% match between data gathered from two different methods, may not be expected.

Seventh, teachers' comments in response to my open question on approaches to teaching Mathematics raised the following issues concerned the classroom organisation for teaching

Mathematics. First, all of them mentioned that they spent most of their time in teaching the whole class, a finding on the questionnaire also. It was, however, not possible to match their responses to item 31 with their comments during the interviews, since the structure of the interview was not concerned with percentages of time which pupils spent in working either as a whole class or in group tasks or individual tasks. Nevertheless, there was a match between their responses to the interview and a ranking of these three ways of classroom organisation which was done on the basis of their responses to Item 31.

Second, a correlation was identified between comments of five teachers about the appropriateness of these three ways of classroom organisation and their responses to item 31. The following comments provide an illustration of this correlation:

> "I believe that generally you should spend most of your time in working as a whole class since you can easily identify your pupils' reactions. You also have to provide opportunities for your pupils to work in collaborative tasks in groups of three, four or even six pupils. Finally, you can offer some individual tasks but this means that pupils should spend the least of their time in working in individual tasks. This is what I found as the most appropriate approach and this is what I usually do" (Beginning teacher 2 responses to item 32 of the questionnaire were for: 32a=10% 32b=30% and 32c=60%)

There were, however, twelve teachers who acknowledged that they spent most of their time in working with the whole class, but this was not because they considered it as the most appropriate approach. A gap between their perceptions

of teaching Mathematics and their curriculum practice was therefore identified. Seven of them took the view that working in group tasks took pupils more time to cover Mathematical topics and to adjust to this way of working, since pupils in Cyprus usually work as a whole class. The following comment echoes this perception:

> "I like to provide opportunities to my pupils to work in collaborative tasks but I can not do it so easily. I do not have much space in my class to arrange tables in groups. But what is the most important obstacle of working in groups is the content of the curriculum which we have to cover. This cannot be achieved, if we use this approach. When I work in groups my pupils are very noisy and it takes me at least 30 minutes to move the tables and ask them to keep quiet. If I were not under stress, I could use group work more often and work with the whole class less often" (Teacher B.2)

The other five teachers indicated that they wanted to spend more time on individual tasks, but that they did not have adequate time to teach all these topics of the curriculum following this approach. Manageability problems and problems with their planning were also seen as obstacles for any attempt to use the individual approach for teaching Mathematics and especially since they did not have many resources to individualise tasks. Textbooks were seen as not helpful. Furthermore, they acknowledged that spending most of pupils' time in working as a whole class was appropriate only for pupils who are neither low nor high attainers. Finally, they argued that although the content of the curriculum could be taught to the whole class by spending most of pupils' time in working as a whole class, this might not help low attainers to learn it and high attainers to

learn as much as they could. That is to say they saw it as leading to difficulties in differentiation.

Thus, the main source for the gap between perceptions of teachers and their practice may lie in the way the system is operating and particularly policy requirements in respect to the content of the curriculum they have to teach in their class. This led teachers to organise their classroom in such a way that pupils spent most of their time in working as a whole class even when neither the teachers nor the policy documents consider this as the most appropriate way of classroom organisation. Nevertheless, the five teachers who mentioned that they spent more time in individual tasks had responded to item 32 by showing that in contrast to the other seven they spent more time in working in individual tasks than groups tasks. This can be seen as an indication of the validity of this item.

Finally, most of the teachers who were interviewed argued that the content of the curriculum could not easily be covered, unless their pupils spent most of their time in working as a whole class. This is in line with the questionnaire data. Moreover, there was a match between responses of the 17 teachers who had supported that argument during the interview and had responded to item 30 by indicating their disagreement with it. Match between the responses of the remaining three teachers to interview and questionnaire can be also identified, but these teachers believed that the requirements of the curriculum could be

achieved by their pupils. It can be, therefore, argued that the validity of this item is very high.

1.4) Methods of assessment in Mathematics.

An analysis of teachers' responses to the fourth open question, concerned with the methods of assessment, is presented in this section. First, all but one teacher supported the idea that assessment should be integrated into teaching, in line with their responses to item 16. The lack of a match on the response of the other teacher had to do with the fact that interview method revealed that he agreed that assessment should be a natural part of teaching, but this could not be done when written tests are used to assess. It is possible that some of the teachers who agreed with item 16 accepted it only in respect to oral techniques and not when written techniques are used.

All teachers supported the idea that assessment should be based either equally on process and product or on the process rather than the teaching outcome and this is in line with their disagreement with item 23 of the questionnaire. Thus, there was a match between the responses of each of these 20 teachers on the questionnaire and the interview method. This match can be identified from the following comments:

> "The first thing which I try to assess is the way which they react when I ask them something and the process which they follow to find out the answer. I do not care on whether the answer is correct or not" (Beginning teacher 1)

Third, a clear link between purposes of teaching Mathematics and methods of assessment was identified among comments of eighteen teachers who argued that attitudes and pupils' ability to apply Mathematics in unfamiliar situations should be assessed, since similar purposes of teaching Mathematics were considered as important. This perception is illustrated below.

> "I should try to find out the extent to which the purposes of my attempt to teach Mathematics have been achieved. And since I told you that positive attitudes to Mathematics should be developed, I will try to find out whether they have such attitudes or not. Similarly, since I want my pupils to be able to engage in practical investigations, I have to find out whether they can apply their knowledge in unfamiliar situations. If I ask them to do something which we have discussed some days ago, then it will be like cheating" (Teacher D.1)

In addition, the responses of eight of them to items 24 and 26 showed that there was a match between their responses to the interview and questionnaire. However, four other teachers mentioned that although they agreed that these two aspects of learning should be assessed, they did not think that this could be easily done. They also accepted that they did not assess these aspects, since they did not know how to do it. Nevertheless, they responded to the questionnaire by expressing agreement with these two items. Thus, the interview method showed that the agreement of these four teachers to these methods of assessment should be seen within some limits. On the other hand, two other teachers mentioned similar ideas about these two ways of assessment to those of the above four, but had responded to items 24 and 26 by indicating that they did not know whether

these aspects should be assessed. This implies that their responses to the questionnaire did not describe their perceptions as clearly as the comments which they expressed during the interview.

Finally, five other teachers saw problems only with assessment of attitudes but accepted that pupils' ability in Mathematics should be assessed. For instance, Beginning Teacher 2 said that:

> "I agree that attitudes should be assessed but I do not know how to do it. It is difficult to assess attitudes isn't it? Can you assess them by asking them if they like Maths? I do not think that you will have valid results. I do not think that you have to face such problems if you want to assess their ability to apply Mathematics in unfamiliar situations"

This implies that the former rather than the latter aspect of learning is perceived as more easily assessed by these five teachers and that the validity of item 26 may be less problematic than that of item 24.

The last key issue identified by teachers is concerned with the appropriateness and ease of techniques of assessment. Direct comparison with the quantitative data cannot be made since, it was not my intention to ask teachers to rank these techniques according to their ease or their appropriateness, but rather to clarify their perceptions about methods of assessment. Thus, comparison between quantitative and qualitative data was made only when this was possible. Nevertheless, interviews with 15 of these teachers showed that they did not consider either written or oral techniques as more or less appropriate and this is comparable to

questionnaire findings of these 15 teachers and also of the Cypriot teachers generally (p. 181). This view was attributed by two of them to the fact that teaching Mathematics is supposed to deal with both oral and written tasks and hence assessment should be done with both oral and written techniques.

There were, however, three teachers who considered oral techniques as more appropriate than written tests and two others who considered written techniques as the most appropriate. Although this finding is not directly comparable to their own responses to the questionnaire, a calculation of the mean of the four written techniques and that of the four oral techniques provided by the response of each of these five teachers to the questionnaire, showed that there was a difference between the perceived means of these two categories for each teacher's response, larger than 1. This may represent a similar distinction between these two categories to that identified by their interview comments.

Furthermore, a match between responses of comments from six teachers concerned techniques which are either the most or the least appropriate or the most or least easy and their responses to item 35 was identified. A typical case of such match is illustrated below.

> "If I had the opportunity to discuss with each pupil separately, then I could identify what he knows and what he does not. However, it is very difficult to use this technique since this technique is time consuming. Although this is the most appropriate technique I do

> not have time to do it" (Response of Teacher E.2 for interview was 1 in column A and 8 in column B)

The argument provided in the previous chapter that Cypriot teachers do not have a coherent view about the category of oral techniques was supported by qualitative data concerning perceptions about techniques of assessment shown in the interviews.

> "Although written tests help me more, because results can be easily shown to the parents and parents can understand what they mean, I believe that oral techniques provide further information about children's difficulties and are more valid. In addition, oral techniques allow you to find out something at the time which you really have to have a feedback." (Teacher D1)

The last issue concerning techniques of assessment has to do with the opinion of teacher A.2 that the ease of techniques of assessment has also to do with the age of the pupils. It was argued that oral techniques were more appropriate for pupils of year 1 who do not know how to write or read. And although this seems to be very obvious, she also said that inspectors asked them to use written tests for assessment, in order to have evidence about pupils' abilities to show to parents. This issue is related also to the influences on practice and is analysed below.

1.5) Influences on practice

Interview with these 20 teachers raised issues related to the influences of the five factors upon their practice, compared with their responses to the questionnaire. The main finding of this section is that there was a match between

quantitative and qualitative data on influences of all the factors except of the influence of inspectors.

Influences of Colleagues (Teachers and Heads).

There are four points on the influence of their colleagues upon their practice derived from the interview data comparable to their responses to the questionnaire. First, 14 of the teachers mentioned that they were influenced by their colleagues, but they wanted them to be able to influence them to a greater extent. Comparing the responses of these teachers to items 34 and 33, we can see that all of them had ranked item 34a (colleagues' influence in an ideal case) and 34b (heads' influence in an ideal case) higher than for 33a (colleagues' influence in practice) and 33b (heads' influence in practice) respectively.

Second, there were three of them who accepted that they were influenced to a very great extent by their colleagues and indicated their satisfaction with the environment in which they worked. Their responses to items 33a and 33b had also revealed that they were influenced to a very strong extent. However, there was one teacher who ranked item 33 higher than that of item 34 and this can be explained, if we take into account her comments that:

> "When I started teaching, I used to adopt all the teaching tasks of the experienced teacher who used to teach pupils of the same year group. However, I realised that this was not helpful. She used to tell me that her pupils knew everything and responded positively to the tasks which she gave them. I could not understand why my pupils were not able to do the same. Nevertheless, very soon, I decided to use my own activities and not to give them the tasks which she told me to do. That is why I think that other

> colleagues should not be so much influential on your classroom and you should have the control of your practice" (beginning teacher 7)

Fourth, teachers of Schools A and D considered their head's help as very important and expressed an appreciation for their heads, whereas five out of six teachers of the other three schools accepted that their heads could not influence them a lot, due to their working conditions. The sixth one believe that her head was not able to help her, since she was not trained to do so. This finding is comparable to the quantitative data showing that there was a statistically significant difference between responses of teachers of these two groups of schools about the influence of their head (p. 236). In addition, my argument that this difference has mainly to do with the heads, rather than different ideologies of these two group of teachers (p. 237), is supported by the following comments which are typical to comments of teachers of Schools A and D.

> "Our head is very good and he knows Mathematics very well, but what is most important is that he wants to help us. I think that he can influence us, because he knows how to approach each of us and give the most appropriate advice to us. I think that he influenced all of us and particularly me, with his valuable suggestions" (teacher A.1)

Pupils' Influence

All teachers considered that teachers should be influenced by pupils. Although these comments are not directly comparable to their responses to the questionnaire, which are concerned with the extent of influence, it can be argued that there is a match between quantitative and qualitative data, derived from each of them. First, four of them who

had ranked item 33d by indicating that pupils had "definite" influence on their practice, mentioned that they took pupils into account when they organised their teaching and provided them tasks at appropriate level, but not in any other case.

> "I obviously take into account my pupils' ability when I have to plan my lessons in Mathematics. I have also to accept that, if you have to do with good pupils (implying high attainers) then you offer them more and more difficult tasks. But I should say that I do not agree with those who say that you have to ask them what, how and when they want to learn. If you ask them, they will tell you that they want to play games and do PE" (Teacher B.2)

On the other hand, five of them who had thought that pupils should be able to influence them strongly (item 34d = 5) argued that pupils' interests should be taken into account and that pupils should feel comfortable when they are taught Mathematics. They therefore appeared to support "child-centred" approach.

Parents' Influence

Most teachers believe that parents did not influence them and they ranked item 33c, by indicating that parents had either "little" or "not at all influence" on their practice. In addition, they believed that parents should not be involved with teachers' work and hence they had ranked item 34c, by indicating that parents should have either "little" or "not at all" influence on their practice. In addition, comments of two of them revealed that they considered parents' influence as harmful. This can be seen as in line with the fact that they had ranked item 33c and 34c, by

indicating that parents had not influenced them and that parents should not influence them at all.

Inspectors' Influence

There is an apparent contradiction between quantitative and qualitative data derived from 8 of these teachers about inspectors' influence on their practice. Although they had responded to item 33, by indicating that they were strongly influenced by their inspectors, their interview comments revealed complaints about the fact that inspectors visited their classes rarely and did not provide them with any significant advice. A typical example of their comments is given below:

> "I think that inspectors are not particularly helpful. I can not see how my own inspector helped me. He sits at the back of the classroom and observes me teaching. At the end of the lesson he refers to one or two aspects of my lesson, by providing general comments. Inspectors do not help teachers. I think that they should come occasionally to your class to observe you while you are teaching, but in other cases they should come to teach your pupils in order to show you various approaches and how you can put their suggestions into practice." (Teacher C.2)

It can be however argued that this apparent contradiction between teachers' responses to interview and questionnaire, is due to the fact that teachers' responses to the questionnaire were concerned with the extent of inspection of their practice, which implies that they can influence it, whereas teachers' comments during the interview, were about the help which inspectors could provide to teachers. Thus, this mismatch might arise from a focus of these two methods on the two different aspects of inspectors' role, as

advisers (interview) and responsible for ensuring the implementation of curriculum policy (questionnaire).

In contrast to the above contradiction between the quantitative and qualitative data, four teachers mentioned that inspectors helped them and that they wanted them to be of more help, in line with their questionnaire response that they were strongly influenced by inspectors and that they wanted them to do so.

A clearer match between quantitative and qualitative data on inspectors' influence can be seen in terms of the fact that 18 of them had responded to item 34 by accepting that inspectors should influence them strongly and during the interview suggested that inspectors should act as those who can give advice in a framework of good relations with teachers.

Influence of Policy Documents

The final kind of influence was policy documents, where both quantitative and qualitative data suggested that it was strong. The interview revealed more detailed views. First, teachers are supposed to cover the content of the curriculum within a period specified in the documents and this was seen as a significant aspect. It has been already mentioned that some teachers could not follow approaches which they considered as the most appropriate, because of the need for curriculum coverage and hence it can not be always seen as a positive kind of influence. One teacher clarified this issue further by suggesting that:

> "The fact that we have to cover all these topics and that pupils are supposed to know all these aspects of Mathematical knowledge, makes me wonder whether policy documents are really interested in other aspects of learning than knowledge. I think that both policy-makers and curriculum encourage teachers to be interested on how to provide their pupils with knowledge, than with investigation skills, even if they do not want to accept it" (Teacher C.1)

This implies a policy confusion and that documents support progressive ideology but their requirements force teachers to use teacher-centred approaches.

Another essential element of teachers' perceptions about policy documents' influence on practice, is the fact that textbooks rather than the New Curriculum are the most significant influence on practice and this is in line with questionnaire data derived from teachers' responses to item 32 (p. 177). In addition, a match between the responses of each of them to interview and questionnaire was identified, irrespective of the fact that two of them indicated that "triminiaia" rather than textbooks influenced them most. This match between responses to interview and questionnaire suggests that this item has a high validity. Furthermore, comments of three other teachers revealed that they were influenced by policy documents, which provide them with practical suggestions, but not by the New Curriculum which they had never studied thoroughly. The following comments illustrate this point:

> "I have seen the "New Curriculum" only once in PAC, when I had to write an assignment about teaching a topic in Maths. Since I have been appointed to this school, I could not even find it in the library of the school and since new teachers do not have their own

> copy, I never tried to read it or organise my lessons in light of its suggestions. However, it is too theoretical and does not provide any suggestion on how to teach. This is not so for other documents which have guidelines and which influenced my practice" (Teacher C.1)

Nevertheless, similar suggestions were made from 14 of them who mentioned that policy documents should provide guidelines and practical suggestions on how to teach and this seems to lead to a similar conclusion to that identified in the previous section, suggesting that Cypriot teachers did not see a need for reconceptualisation of the educational system in Cyprus.

1.6) Management of Change and ways of improvement curriculum practice.

Although the interview schedule does not deal with the management of change or ways of improving assessment, interviews with some teachers covered four issues of these two aspects of curriculum policy, which were raised in their attempts to clarify further their opinions about teaching and assessment in Mathematics. Thus, the following four issues are mainly concerned with an attempt to complement the quantitative data than to compare them with the qualitative.

First, the comments of eight teachers revealed that they did not only agree with item 29 of the questionnaire, suggesting that INSET should mainly deal with practical problems which teachers face in their classroom, but also that they considered INSET courses which they attended at PI as mainly dealing with theory rather than practice. Thus, the

interviews revealed teachers' disappointment with policy on teachers' professional development and a coherent opinion arguing for reform in policy on teacher development. However, this reform was seen in terms of courses offered by PI and only after a follow up question were the teachers able to express agreement with INSET organised at the school level. Although their responses showed that they had never thought about having school-based INSET, two of them saw a possible introduction of this kind of INSET as "a real change on the way schools are operating" (Teacher E.2).

These eight teachers also considered INSET dealing with problems which teachers face in their classroom, as an essential way of improving curriculum practice. This is in line with their responses to item 36a that these eight teachers considered this kind of INSET as either the most or the next most important way of improving assessment. Moreover, they suggested that teachers should attend INSET courses, since this is the only way of getting information about innovative ideas which could help them to improve their teaching style and obtain better results. The following comments are typical of their perceptions about INSET and revealed the significance of the two aspects analysed above.

> "I believe that INSET is not only the alpha and omega of teachers' professional development but also the alpha and omega of the effectiveness of the educational system. However, courses which I attended in PI and especially courses of "Epimorfose", which I attended last year, were not at all relevant with the problems which I have to face in my classroom. I expected to be informed about innovative ideas on teaching Mathematics and the only thing which I heard was a suggestion on teaching more than one topic at the same time. You

> know teaching the four operations at once, rather than separately as previously. Obviously this has not helped me with problems which I have to face in my classroom and the tutor has never explained us how this can help us to cover the content of the curriculum. On the contrary, I am confused on how this approach can be used. Believe me, when I tried to use it I faced lots of problems. Nevertheless, I believe that INSET is the only way which can help teachers to change their style and become more effective and this is what change means. Sometimes you can see this in terms of those individual teachers who are keen on INSET and can change their style and bring better results, in contrast to those who do not attend anything and repeat themselves" (Teacher C.1).

It can be argued that these comments reveal a particular perception of the process of change, which seems to be in line with theories on curriculum change suggesting the need for a strong link between INSET and curriculum change (Fullan and Hargreaves 1992a) and with Fullan's (1993) opinion that not only collectivism but also individualism must have power in any change effort. It can be also argued that the idea that problems are the friends of change (Fullan 1993, p. 25) or putting it in other words that conflict is essential to any successful change effort (Stacey 1992, p. 120) is illustrated in her comments about trying to put this suggestion into practice.

Two teachers responded to item 36a by indicating that they considered more curriculum time as the second most important way of improving assessment. However, their comments during the interview revealed that they believed that more curriculum time in Mathematics, could help them to organise their classroom in such a way that pupils would be engaged in group tasks, than in working most of the time as a whole class. This mismatch between their responses to interview

and questionnaire may be attributed to the fact that these two teachers believed that the improvement of assessment practice was strongly related to the improvement of teaching. This assumption is supported by the fact that they considered assessment as natural part of teaching. On the other hand, this contradiction may be attributed to the fact that these two teachers did not take into account how assessment could be improved, but how teaching in Mathematics could be improved when they had to answer this questionnaire item. The latter assumption raises an issue related to the validity of this item discussed below.

The above argument is further supported by the third issue on ways of improving assessment, namely having smaller class size than now. Three teachers considered this as the most important way of improving assessment according to their responses to item 36b of the questionnaire and the interviews revealed that they saw this as related to a focus of classroom organisation, in which pupils spent most of their time in working on individual tasks rather than on how assessment could be improved. It could be claimed that when pupils are working on individual tasks, interviews or other oral techniques of assessment can be used easily. However, the fact that these teachers did not mention how having smaller class size could help them to solve such problems of assessment, raises doubts on whether they took into account how assessment can be improved, rather than teaching, when they had to answer this questionnaire item.

Finally, the interviews showed that an essential aspect of teaching Mathematics was not raised by the questionnaire. This was to do with the resources for teaching Mathematics. Five teachers mentioned that Cypriot schools did not have many resources and the fact that these teachers (Teachers A.1, D.1, E.2 and Beginning Teachers 4 and 10) worked in five different schools suggests that this may be a common problem for Cypriot primary schools. This was supported further by comments of teacher D.1 who had more than 20 years of experience and worked in many schools. She revealed that:

> "Because there are no resources in our schools, and this is something which I found in all the schools which I had to teach, teachers should give to each other any teaching mean they have made themselves or found. For instance, more textbooks are needed and if I know that Leonidas has got some schemes, I should ask him to lend me these schemes in order to get some ideas and copy them. Although this is not a systematic way for having resources, it can be seen as the only possible solution, until politicians decide that more money should be spend on education. It also reveals the importance of collegiality and having a school policy which I mentioned previously. We actually tried to do that five years ago when I used to work in another school. We had an extra room and we exhibited all the means which we had. Teachers could either work with their pupils in this room or borrow some teaching means and work in their classrooms".

This comment reveals that there is perceived to be a serious lack of learning resources in primary schools in Cyprus. Although questionnaire did not include any item related to this aspect of teaching Mathematics, Teacher D.1 responded to the open-ended question of the questionnaire (Item 38) by showing that she believed that having more learning resources was an essential way of improving teaching

Mathematics. However, the lack of a specific questionnaire item should be acknowledged. This finding reveals the need for using both questionnaire and interview method and can be linked to the justification of the methods used, provided in Chapter 4.

In conclusion, although possible explanations were provided for those few cases where a mismatch between the data gathered by the interview and questionnaire was identified, it should be acknowledged that it is also possible that some degree of mismatch may have to do with the validity of the methods used. It is possible that some teachers behaved inconsistently. Some of the teachers who gave an interview after they completed the questionnaire may have been made to think more closely about the issues of teaching and assessment in Mathematics raised by the questionnaire. Thus, it is possible that these teachers had realised that they did not subsequently have the perceptions which their responses to the questionnaire imply. For instance, the two teachers who did not give the same responses to questionnaire and interview about the item concerning the need for teachers to follow a pre-specified sequence in Mathematical topics (p. 275) may have thought about that need after they had completed the questionnaire and come to believe that there was such need. In addition, in an interview it may become clearer what the items are referring to whereas questionnaire items, despite trialing, may not be so clear and unambiguous, as explanations can not be given. Thus, it is impossible to expect to have 100% match between the two methods.

2) Supplementary information gathered from interviews with 10 teachers of the five primary schools: School-based Curriculum Development

Interview with teachers of these five schools was not only concerned with their perceptions about items related to the questionnaire, but also on their views about the development of a curriculum policy in their schools. The principal issue, common to all schools, which arose from interviews with the 10 teachers of these five primary schools was that school based policy was very weak in these schools. This perception is very precisely described by the following comments of one teacher:

> "I believe that each school should have some guidelines about teaching and assessment of each subject, which should be common for all year groups. This is something which we have never discussed in our staff-meetings. For instance, a policy about assessment is essential, since it helps teachers to understand record keeping of their colleagues easily. This policy should be decided at the beginning of the school year and as soon as a problem has been identified, decisions for solving this problem should be taken. I think that it is very easy for you to see that such policy has not been developed in our school. You may also know better than me that there is no school in Cyprus which has its own curriculum policy." (Teacher A.1)

Although school based curriculum development is seen as very weak in Cyprus, it is considered as essential. The following seven issues related to aspects of school based curriculum development emerged from their comments.

2.1) School based policy and the New Curriculum

First, there was no coherent view about the extent to which school based curriculum policy should be different from the New Curriculum. Six out of ten saw this policy as related

simply to the content of the curriculum. It was, therefore, argued that since some schools have more high attaining pupils than others, teachers of these schools should be able to cover topics in addition to those in the New Curriculum. On the other hand, schools who have more low attaining pupils than others should define the basic topics of the curriculum which should be taught. Thus, differentiation was seen only in terms of the content of the curriculum. However, the other four teachers argued that the special characteristics of each school should be identified by teachers and be reflected in decisions about any aspect of the curriculum. This can be elucidated by the following quotation from one of these four teachers' comments:

> "For instance, in our community parents cannot help their pupils in Mathematics, since most of them did not go to a secondary school. Thus, we could decide that pupils should not have to do homework and that we should not expect parents to help them. I have been to this school for four years and only at the end of my first year I realised that. Don't you think that it would be better if I heard about that from other colleagues in a staff-meeting concerned with the development of a school policy?" (Teacher C.2)

In addition, three of these four teachers believed that school based policies should take into account pupils' interests and that teachers should adjust teaching activities to their experiences. Finally, these four teachers supported the need for a kind of small scale research conducted by teachers to provide evidence about the development of their school policy. One of them suggested also that this evidence could be used from the government to evaluate the national curriculum policy. The restricted view about development of a school based policy held by the other

six teachers is illustrated by the fact that they did not mention that school based policy could be differentiated in terms of other aspects than the content of the curriculum and that they asked for more specific guidelines from government. They were interested only in implementation. The following quotation echoes this view:

> "If they send suggestions for an innovation, they should also send samples of teaching activities related to that to enable us to understand what they mean. ... Teachers do not have time to do the job which should be done from those who are above them (She implies the officials of the Ministry of Education). Teachers should receive practical suggestions about activities which they should put into practice" (Teacher D.1)

This quotation is a typical one of these six teachers and it is explicitly related to the hypothesis upon which the "centre-periphery" *model is based. They treated the* government policy as unproblematic. It can be therefore argued that the "centre-periphery" model is supported by these six teachers and that is why they conceptualised school based curriculum development narrowly.

2.2) Administration of the system and school based policy

Second, all the teachers of these five schools claimed that school based policy could not be easily developed in Cyprus and attributed that to the centrally controlled administration of the educational system in Cyprus. This is elucidated by the comments of one of these teachers, who had attended also a course at the University of Wales, and was influenced by her studies of the British educational system.

> "Officials of the Ministry of Education in Cyprus do exactly the opposite of what I suggested previously. They try to make all the schools to look similar and if one school differs from the others they do not like it and try to make it like the others. This is not the case in England and that is why I like the English system." (Teacher C.1)

2.3) Relations among the staff and school based policy

Third, the kind of relations among the staff of each school (teachers and heads) was considered by all of them as an essential criterion for the effectiveness of any attempt to develop a school based curriculum policy.

Fourth, comments of teachers of these schools revealed that the development of a school based policy does not depend only on the relations among the staff, but also on teachers' perceptions of collegiality. This can be seen in terms of the fact that although all of them mentioned that there were good relations among the staff of their schools, there was no evidence to show that teachers of any school co-operated systematically in teaching Mathematics. All these teachers revealed that they used to struggle with their problems and anxieties privately, spending most of their time apart from their colleagues. The only evidence related to co-operation was the fact that teachers of the same year group of each school, used to plan together in an attempt to keep a balance between the content which was covered by the classes of the same year group in each school. In addition, teachers of the same year group in each school planned together their written tests. However, these results were kept by the head of only one school.

Fifth, attempts to develop a school based policy and promote cooperation among the staff were seen in terms of offering opportunities to teachers to visit the classes of their colleagues. However, this approach was not adopted in practice in any school for the following reasons:

> "There are teachers in my school who are very haughty and thereby do not ask for help from any colleague. I do not agree with them and I usually ask everybody to give me his/her advice. I used to be like them. However I realised that it is shameful if you go to your class and do something wrong, rather than if you go and tell to Leonidas 'tell me my friend, what can I do in this situation?'. Nevertheless, the fact that our job used to be very competitive makes some teachers reluctant to give any advice. In addition, the fact that those who visit our classes are those who want to evaluate our teaching abilities makes some teachers suspicious when colleagues visit their classes. But I told you I would like to have somebody to come and visit my class and at the end to tell me "Don't you think that you did a lot oral work and nothing written work". This is the best feedback which I could have." (Teacher C.2)

The reason therefore, has to do with the experiences of Cypriot teachers in a system which has never encouraged co-operation among teachers, and this has led them to be suspicious and isolated from other teachers.

2.4) Head's role and development of school based policy.

Sixth, there was no overall agreement about head's role. Teachers of School A indicated that their head used to come and teach their pupils and discuss with them about teaching Mathematics. They considered these visits as an important way for improving their abilities in teaching Mathematics. The following comments of one of the teachers of School A illustrate precisely opinions about the visits of this head:

> "I remember the first visit of my head very well. I had to teach my pupils for 20 minutes and then he had to teach them for the another 40 minutes. I was very afraid, but I felt better later when I realised that he did not do that to tell me I did well or bad, but to help me to improve my teaching skills in Mathematics. He also accepted that he could teach better from what he did and that encouraged me a lot to try again. Now I can say that my head helped me a lot and now I feel more confident in teaching Mathematics" (Teacher A.2)

On the other hand, the eight teachers of the other four schools indicated that their heads hardly visited their classes and that they did not give them any advice. However, all of the teachers considered that their heads should be responsible for their professional development and they should not mainly deal with their administrative duties. All of them agreed that heads should visit the classes of their teachers and give them advices. They believe that such visits of heads might contribute significantly to the development of an ethos promoting school based curriculum development. However, the following comments quoted by two teachers, give an indication of perceptions about the barriers to such change in heads' role:

a) "Every school should have its own policy, but I think that this can not be achieved in Cyprus, because of the way heads are appointed. I had three different heads in my teaching career and I found out that those who had a post graduate qualification were more skilful, whereas most of the others could not organise their school and could not help their teachers. The schools of the latter group of heads may be clean, but they can not promote purposes of education as good as those of the former". (Teacher E.1)

b) "Since my head has got all these administrative duties, you know, she has to send letters, etc, she does whatever a secretary has to do, rather than a head of a school who is supposed to support teachers and provide them advice about their teaching. This bureaucracy does not allow you to discuss with her about teaching

> rather than about this or the other event. Thus, staff meetings are boring and not a place where you may learn" (Teacher C.2)

The first comment raised the failure of the way teachers' appraisal is conducted. The fact that heads are simply teachers with substantial teaching experience, does not mean that they are also the most skilful. On the other hand, the second comment is widely shared by all of these ten teachers, but nothing has been done to change heads' duties and working conditions. Similar use of time was reported about English primary heads by Blease and Lever (1992)

2.5) Co-ordinators and school based policy

Finally, the two schools which had co-ordinators (Schools B and C) were not differentiated in terms of the way which they operated from the other three schools. These co-ordinators did not manage to act as co-ordinators in practice. Their role was restricted to giving advice informally to the few teachers who asked them for it from time to time. Moreover, both of them said that co-ordinators should have a more substantial role and suggested that they should have more time free of class contact in order to prepare guidelines, and materials and learning resources for their colleagues. This opinion was shared by all the other teachers who also argued that co-ordinators should have a higher level of subject knowledge than that of other teachers. A typical example of teachers' perceptions about the co-ordinator's role, given by the co-ordinator of School B, is illustrated below.

> "I was co-ordinator of Mathematics in my school simply because I had more years of experience than all the other teachers of Cycle A. The only thing which I did, was to answer some questions of two new teachers who came a couple of times to ask me something. But even if I were not co-ordinator, I would have done the same. I think that co-ordinators should have more free time in order to spend it with their colleagues and plan together and why not teach together. They can present some ideas about teaching Mathematics in a staff meeting ... However, they will never go to visit the class of any teacher, in order to see if she is a good teacher or not. This is not a co-ordinator's duty." (Teacher B.2)

It can be argued that teachers' comments about issues related to the development of a school policy, raised in this section, showed that there was a very weak school based curriculum development in these schools. They attributed the lack of school based curriculum development to the high extent to which the centre exercises control at the school level, which does not allow any differentiation among the schools. A reconceptualisation of heads' and co-ordinators' role which might promote cooperation among the staff of the school was seen as an important way of developing school based curriculum development. An interpretation of the findings derived from the questionnaire taking into account the interview data and especially the fact that these schools did not develop any school policy will be provided in the next chapter, which draws implications from these findings for the way curriculum change should be brought about in Cyprus.

CHAPTER 7: DISCUSSION

The analysis of data in the previous chapters is primarily based on a description of Cypriot teachers' perceptions and the differences among various sub-groups' perceptions. The purposes of the research are to develop explanations of why Cypriot teachers have such perceptions, and to explore the implications for curriculum policy in Cyprus. This chapter explores five related themes and draws particularly heavily upon the interview data for raising policy proposals. Where relevant, cross reference to the interview data is provided in the text.

The first section presents implications of Cypriot teachers' perceptions for curriculum reform in primary Mathematics in terms of the extent to which it was accepted by them. An exploration of the factors influencing their perceptions is attempted in the second section, where the null hypotheses set out in Chapter 1 are tested. Third, implications are drawn about these influences for both teachers' professionalism and the process of curriculum change by testing the theories of Fullan about change and Nias about collaborative culture presented in the review of the literature. The fourth part presents a strategic direction for curriculum change in Cyprus, including the incorporation of teacher perceptions into the change process. A more appropriate model of curriculum change than the existing one is presented. This model is an heuristic device for inspecting the various factors which influence teachers' perceptions and thereby the process of change. The difficulties of introducing this model are taken into account and a short-term strategy is also provided. Finally,

the limitations of this research and a need for further research are presented in the last part of this chapter.

1. IMPLICATIONS OF CYPRIOT TEACHERS' PERCEPTIONS FOR CURRICULUM REFORM IN PRIMARY MATHEMATICS IN CYPRUS

1.1 Purposes of Mathematics with special reference to the role of language

Howson (1989, p.18) believes that "clear objectives are needed but to be effective they must be objectives accepted by teachers", a view that is the basic focus of my research. It is clear from the questionnaire responses that Cypriot teachers' perceptions of the purposes of Mathematics generally conform to the purposes promoted by inspectors (Appendix A) and emphasised in the current curriculum reform in Cyprus. They supported the purposes relating to investigative tasks and promoting mathematical knowledge and thinking identified in both the Curriculum of 1981 (Ministry of Education 1981, pp.81-82) and the New Curriculum of Cyprus (Ministry of Education 1992a). There is also agreement for consideration of Mathematics as a useful tool for children's life.

The New Curriculum proposed that one purpose was the development of pupils' ability to talk about Mathematics. Doubts about whether this should be seen as a purpose can be raised in so far as the role of language in teaching Mathematics can be seen as a teaching *method* that may help pupils to see Mathematics as a language (Pimm 1981) and as a part of our culture, (Bishop 1989). Nevertheless, a low

priority was given by Cypriot teachers to the role of language in teaching Mathematics which might be explained by the fact that the New Curriculum did not make explicit the implications of this purpose for teaching whereas implications of the other two purposes for teaching methods were provided. This policy contradiction may be explained by the fact that the 1981 curriculum did not promote this purpose (Kyriakides 1992) and teacher training is not focused upon the role of talk in teaching Mathematics. It is important that both ITT and INSET, in addition to concentrating on the importance of the language in the teaching of Mathematics, should also provide teachers with more specific ways to apply language in classroom settings.

Evidence about the perceived importance of the four purposes promoted by curriculum reform in primary Mathematics are comparable to a large study carried out in Britain by Ashton et al (1975). A considerable agreement about aims among the 1513 English teachers was reported even though they could not be easily divided into those accepting the progressive ideology and those accepting more traditional roles. Likewise, there was substantial agreement amongst Cypriot teachers about the purposes of teaching Mathematics and they gave high priority to purposes concerned with both how children would be able to gain mathematical knowledge and solve investigative tasks. Delamont (1987) argued that the traditional-progressive polarity in respect of English teachers was false:

> "If we examine the evidence on what teachers believe, we find that ever since 1948 there has been a division between those espousing traditional and progressive

> ideals, and that feelings about these ideals are bitter and vehemently held. However, underneath the simple picture of stable, opposed groups, one made up of sensible teachers and the other of inexperienced and ivory-towered lecturers, the reality is more complex. ... The idea of the teachers who ignore basic skills is very much a creation of "traditionalists": very few teachers have ever been found in real life" (p. 11)

Likewise Cypriot teachers saw no conflict between the traditional purpose of gaining basic knowledge and the more child-focused style involved in solving investigative tasks.

1.2 Active pedagogy and central control

Cypriot teachers supported items concerned with an active pedagogy and their responses to these items showed high inter-correlation. Furthermore, a correlation among Cypriot teachers' perceptions about purposes of Mathematics and methods of teaching was identified. This implies that Cypriot teachers had a coherent view about active pedagogy, emphasising the value of practical activities, investigative tasks and discussion. This seems to be in line with the findings of Taylor and Reid (1973) indicating that there was a strong tendency for teachers to agree with learning by discovery. In addition, Richards (1975, p. 93) found out that teachers in his sample perceived discovery learning to be an important component of the curriculum.

It has been shown that both the 1981 Curriculum and the New Curriculum directed teachers to engage in an active pedagogy. Teachers were required to give opportunities for pupils to participate in practical and investigative tasks, tasks for small groups working cooperatively, differentiated

tasks according to the level of difficulty and individual tasks (Ministry of Education 1992a). It has been argued (Baron 1970) that a Cypriot teacher concerned to obtain promotion needed to demonstrate to her inspector commitment to implementing active pedagogy. This pedagogy has not widely influenced curriculum practice of primary Mathematics in Cyprus (Appendix A), but this can not be attributed to teachers' perceptions of teaching Mathematics.

The interview data revealed that although both beginning and experienced teachers hold strong ideas favouring active pedagogy and invest much of their self-identity in it, many cases occurred when to compromise with beliefs was pragmatic. Such cases were more obvious on issues concerned with classroom organisation. None of the 20 teachers interviewed, agreed with spending most of teaching time in working with the whole class but their practices were dominated by this way of classroom organisation. Pollard (1980, p. 37) reported similar evidence about English teachers and argues that "the issue here is that of the degree of maintenance of a particular self-image or belief compared with pragmatic adoption to situational necessities". This conflict between the teachers' ideal version of practice and their actual practice has implications for their occupational culture (Section 3).

It can be also claimed, paradoxically, that barriers to the implementation of policy on curriculum reform in primary Mathematics of Cyprus may lie in the high degree of central control at school level through national textbooks, a

national curriculum specifying the content of the Mathematics curriculum to be taught to each age-group of pupils and a specified length of curriculum time. These contribute to a mismatch between the ideology promoted by the curriculum policy and the administration of the system. Shuard (1984, p. 26), points out that:

> "(teachers) will find it very difficult to put the commitment into practice .... by the School Board which chooses the textbooks and by the testing system of their state which emphasises goals they do not share".

And although teachers' perceptions about the purposes of Mathematics were similar to the purposes outlined in curriculum policy, the fact that this control did not promote flexible classroom strategies limited the policy's effectiveness. Similarly, Warden (1981) provided an example where the role of language, children's self-control and self-assessment were encouraged as a part of creating an appropriate atmosphere at the school level.

Cypriot teachers in recognising the discrepancy between active pedagogy and practical realities attributed it to the pressure of time arising from an overloaded curriculum (Graph 5; Table 5.1, Item C.5; Chapter 6). Both experienced and beginning Cypriot teachers considered the content of the New Curriculum in Mathematics as difficult for their pupils to understand. It was also found that Cypriot, in contrast to English, beginning teachers considered the requirements of the curriculum policy as unmanageable (p. 251). Thus, as with the overloaded curriculum in England (Campbell and Neill 1990, Campbell et al 1991, NCC 1993), the overloaded

curriculum in Cyprus was a significant barrier to the implementation of active pedagogy. However, although all the teachers considered the New Curriculum as difficult for their pupils, teachers of younger pupils found more problems in teaching the content of the New Curriculum to their pupils. Thus, further research about both the content of the New Curriculum and whether it should be as inflexibly age-related as currently, is needed.

Cypriot teachers' agreement with the idea of an active pedagogy can not be interpreted as implying that they also agree with "progressive" ideology since their practice is not influenced as much by perceptions of the needs of the pupils as by the curriculum documents. The position they adopted is in line with Dewey's views. Galton (1989) argues that

> "Dewey was suspicious of the emphasis placed by other progressives on the 'natural development of the child' with the curriculum chosen by the child rather than imposed by the teacher" (p. 11)

Although my data on teachers' perceptions do not bear directly on these aspects of progressive ideology, the fact that the classroom practice of all the homogeneous groups of Cypriot teachers (Table 5.3) was influenced more by policy documents rather than by the pupils' needs and that only 2 out of 20 teachers raised the issue of children's curiosity when they were interviewed implies that Cypriot teachers objected to "the more negative aspects of progressivism" as Dewey has characterised them. This is in line with Taylor and Reid's (1973, p. 35) argument that "it would be

misleading to represent all or even the majority of Primary teachers as being devoted to the child-centred approach".

1.3 Cross-Curricular approaches

Another important issue concerning teachers' perceptions of teaching Mathematics is their support for a cross-curricular approach, and especially for the application of Mathematics in several subjects. Goldstein (1990, p. 67) observes that:

> "The National Curriculum has been conceived in subject terms with little serious attempt to formulate genuine cross-curricular structures. This has important implications for modes of learning and, to some extent, also for assessment".

Similarly, the New Curriculum of Cyprus is a subject-based curriculum and its assessment and reporting in subject terms is likely to inhibit cross-curricular approach in practice. Furthermore, the existence of a fixed timetable for each subject is a strong barrier for the implementation of such policy.

Sutcliffe (1987) suggests that a cross-curricular approach enables children to deal with problems which they will have to face in their life. And since one of the purposes of teaching Mathematics is to enable children to solve day-to-day problems, this purpose may be achieved more easily if we attempt to deal with the barriers of putting this approach in practice. However, the analysis of curriculum policy has revealed uncertainty about the meaning of the cross-curricular approach (p. 71) and the evidence suggests that

the inspectors ignored the importance of this approach (Appendix A). Pettit (1988, p. 11) called for support and in-service training from the state and indicated the problem of finding time for cross-curricular approaches "given the tight time schedule that will be required for the implementation of the programmes of study". He argued that this training should be not simply concentrated on Mathematics as a specific subject, but on a cross-curricular approach, for example how topics in science or geography could be used to extend children's mathematical understanding. The conclusion here is that practical constraints in the school settings and a policy uncertainty, rather than ideological objections, may prove the most powerful brake on change.

1.4 Classroom Organisation

Cypriot policy documents emphasised that teachers should organise their classroom so that their pupils will spend their time equally on working in individual tasks, in tasks for small groups working co-operatively and working as a whole class. However, working as a whole class is the dominant way of teaching Mathematics. None of the homogeneous groups of Cypriot teachers organised their classroom according to the requirements of the curriculum policy. Evidence about classroom practice in England revealed that English pupils spent most of their time in working alone on a Mathematics tasks (DES 1978, Bennett 1976, Galton et al 1980, Barker-Lunn 1984). And although my English sample is not a nationally representative sample,

the fact that they reported that they organised their classroom in such a way that their pupils spent most of their time in working on individual work, confirms the early evidence on national curriculum implementation which suggests that individual work still dominated classrooms (DES 1992b). It can be therefore claimed that although classroom practice in Cyprus is different to that found in England in 1970s, 1980s and even 1990s, teaching time was not equally distributed to these three ways of classroom organisation in either England or Cyprus. These findings raise doubts about whether curriculum practice can change merely by the publication of national curriculum documents which mechanistically encourage teachers to spend their time equally on individual, group and whole class methods of organisation.

However, only very few Cypriot teachers organised their classroom in such a way that pupils spent all of their time working as a whole class and none of the cluster groups revealed comprised teachers using only one approach. This is in line with studies on English curriculum practice which reveal that the exclusive use of a single teaching method was rarely found (eg DES 1978, Bennett, 1976; Barker-Lunn 1984, p. 179). Similar findings emerged from the English sample in this study.

1.5 Formative assessment emphasised and promoted by curriculum policy

All the Cypriot teachers, but one, considered formative assessment as more important than summative. Furthermore,

the interviews revealed that most of them were ideologically antipathetic to summative purposes. This is in line with MacKernan's (1989, pp 68-69) view that English teachers of Mathematics are hostile to this purpose of assessment. This is also identified by Torrance (1986) examining the implications of GCSE. He believes that "summative assessment is unlikely to prove helpful to teachers who are faced with the day-to-day reality of formative assessment".

It has been shown above that assessment policy in Cyprus, and especially its purposes, was not clearly defined (p.39). Broadfoot (1986) argues that the curriculum policies of countries other than the UK promote a move from summative to formative assessment since they have realised the failure of the summative assessment. Cypriot teachers would welcome the development of an assessment system which promoted the formative purposes of assessment but would be less inclined to support one emphasising summative purposes. It would be helpful therefore for curriculum policy in Cyprus to emphasise the formative function of assessment. However, the Director of Primary Education announced the government's intention to introduce a reporting system where teachers would be required to assess pupils' overall achievement in each subject at the end of each academic year (Leontiou 1993). This raises doubts about the policy commitment to formative assessment since Cypriot curriculum policy is mainly influenced by the English and Greek policy and since summative purposes are emphasised by them (Maurogeorgos 1992). This argument is strengthened by the fact that the Director of Primary Education of Cyprus justified the

introduction of the new reporting system by reference to the assessment reform policy in England (Leontiou 1993).

Interestingly, there was a statistically significant difference between Year 6 teachers and all the others in that the former were less antipathetic to summative assessment. This was attributed to the fact that Year 6 pupils will be assessed for summative purposes in a year's time, since all the pupils of the secondary school are assessed for summative purposes, and hence teachers wished to prepare their pupils to be ready for such kind of assessment. Porter (1986) suggested that infant teachers particularly objected to summative purposes of assessment and this seems to be in line with the above statistically significant difference. These findings revealed the difficulties of developing a national curriculum policy common to both primary and secondary schools ("eniaxrone").

1.6 Assessment as a Natural Part of Teaching: A Coherent Policy about Teaching and Assessment

It has been shown that although Cypriot policy documents argued that assessment should be seen as a natural part of teaching, the practical implications of such conception of assessment are not made explicit. It has also been argued that this conception of assessment may simply reflect their acceptance of the objectives model (see p. 34; Appendix A). However, all the Cypriot teachers but the one who did not consider formative assessment as the most important purpose of assessment, agreed that assessment should be seen as a natural part of teaching. Moreover, a correlation between

their perceptions about methods of assessment and purposes of teaching Mathematics has been identified. Finally, the interview data illustrate implications of this conception of assessment for teaching and specific links between methods of teaching and assessment Mathematics. It can be therefore claimed that Cypriot policy makers should attempt to explore links between purposes, teaching activities and assessment in order to develop an assessment policy which is based on the consideration of assessment as natural part of teaching.

This conception of assessment as natural part of teaching can be also linked to teachers' perceptions about purposes of assessment. Cypriot teachers considered formative assessment and teachers' self-evaluation as the most important purposes of assessment. Since teachers' self-evaluation and formative assessment have direct feedback into the teachers' own teaching, it can be inferred that they considered assessment as a means of providing information to help them to make decisions about their teaching. Thus, their conception of assessment as natural part of teaching and the correlations between their perceptions about teaching and assessment in Mathematics are to be expected. It follows that teachers' interest in the assessment of process can be attributed to the conception of assessment as a natural part of teaching, along the lines suggested by Schwab (1989, p. 8).

Analysis of the evidence of teachers' perceptions about assessment implies that the debate about assessment policy in Cyprus should be focused on how it can be linked to the

policy on teaching Mathematics in order to provide information to teachers about teaching Mathematics taking into account their effort to implement the active pedagogy. Thus, a coherent assessment and curriculum policy should be developed for teacher development, irrespective of other purposes such as national monitoring (Harlen et al 1992). The following two sections provide two issues of assessment policy which should be seen in terms of this suggestion for assessment policy in Cyprus.

1.7 Assessment of a child's ability to apply Mathematics in unfamiliar situations

Although the questionnaire revealed that Cypriot teachers agreed with Item 26 concerning assessment of pupils' ability to apply mathematics in unfamiliar situations, the interview data showed that this agreement should be qualified. Six out of the 20 teachers interviewed mentioned that although they agreed that this aspect of learning should be assessed they did not think that it could be easily done. This raises doubts about the effect of assessment policy in Cyprus especially given that only one document suggests that this aspect should be assessed and does not provide any specific information on how this can be done. However, since both teachers and policy documents regarded investigative tasks as essential for teaching Mathematics, in-service training might be used to focus on problem setting and applied mathematics to illustrate the practical form that formative assessment would take.

1.8 Assessment of pupils' attitudes to Mathematics

Although teachers considered the development of positive attitudes to Mathematics as neither the most nor the least important purpose of teaching Mathematics (Graph 1) and emphasised its importance in their interviews, they did not unanimously support attitude assessment. The questionnaire revealed that half of Cypriot teachers accepted and a quarter of them rejected the idea. It cannot be therefore claimed that Cypriot teachers, as a group, agreed with assessment of pupils' attitudes to Mathematics.

The interview data (p.281) suggested that most of the teachers did not assess this aspect of learning because of lack of skills. That Cypriot teachers did not know how to assess this aspect of learning can be understood by the fact that policy documents indicated that attitudes to mathematics should be assessed but did not explain how this should be done or how information gathered by such assessment should be used or whether record-keeping about attitudes to Mathematics should be kept. Furthermore, neither ITT nor INSET in Cyprus covered this aspect of assessment. It follows that such assessment should be considered in the overall policy development in Cyprus.

1.9 Teachers' perceptions of appropriateness and ease of techniques of assessment: implications for national testing.

Two significant implications emerged from the data on Cypriot teachers' perceptions about the appropriateness and ease of the eight techniques of assessment. First, the

ideological position in Cyprus is less clear cut than in England according to evidence gathered from this study. Cypriot teachers considered the oral techniques which are more formally structured (interview and structured observation) as the most appropriate techniques whereas oral techniques which are not formally structured (unstructured observation) as the least appropriate techniques. This might reflect the highly centralised educational system of Cyprus and especially a perceived need to have "tangible proof" to show to parents and inspectors. With the term "tangible proof" they meant information gathered from assessment which can be easily understood by parents and inspectors since numbers can be used to represent pupils' attainment.

However, the appropriateness of the techniques of assessment should also be judged on the kind of information they make available to teachers. Thus, inspectors should encourage teachers to use techniques which can help them diagnose pupils' needs irrespective of whether they are more formally structured. Nevertheless, the Ministry of Education (1992c, p. 3) intends as a matter of policy simply to publish a series of written tests, but not to provide anything related to interview or structured observation which are considered as appropriate techniques by Cypriot teachers. Thus, if assessment policy emphasises only written tests, it would neither find ideological support among teachers nor improve assessment practice, but it could provide the government with another way to "control" curriculum practice.

Second, there was an inverse relationship between assessment techniques seen as most appropriate and those seen as most easy in both Cypriot and English samples of teachers. All groups of teachers regarded the most appropriate techniques as the least easy. This can be connected with the findings about National Curriculum Assessment (SEAC 1991, Campbell et al 1991, DES 1991b paras 39/40) that assessment activities were difficult to manage in conventional classroom conditions.

It can be also linked to the teachers' perceptions showing that Cypriot teachers considered further training in techniques of assessment as the most important way of improving assessment. Moreover, Cypriot teachers believed that their in-service training should be concentrated on the problems they have to face in their classes rather than theory. Thus, INSET focused on the use of interview and structured observation may be a more effective way of improving assessment rather than the publication of more policy documents which are rarely consulted. This provides significant implications for educational policy in Cyprus (see p.364 below) which has not systematically used INSET to bring about change and has not been directed at the implementation of the current curriculum reform at the school level. The practice therefore goes against the evidence that innovations need both external and local support to succeed (Hubermann and Miles 1982, Crandal et al 1986, Turnbull 1985).

2 FACTORS INFLUENCING TEACHERS' PERCEPTIONS

Two quite distinct ways can be used to draw implications from teachers' perceptions of curriculum reform in Mathematics in order to evaluate curriculum policy in Cyprus. One is to accept the policy as it stands and then to consider how successful it has been in terms of the extent to which teachers accepted it. The second one is to examine the reasons for teachers' agreement or disagreement with policy. The first kind has been provided above. This section has implications for the second and has a focus on the factors influencing teachers' perceptions and especially the policy implications.

2.1 Central control over schools

The following three characteristics of Cypriot teachers' perceptions can be attributed to the high extent of control of the state upon teachers. First, it has been shown that statistically and educationally significant differences between Cypriot and English beginning teachers were associated with the extent of central control on the curriculum. A similar finding was identified by a comparison of perceptions of these two groups when they were at the end of their training.

Although the educational systems in England and Cyprus are not different in terms of organisational structure, the extent to which they can control the curriculum in school and at classroom level are different (Chapter 3). Coulby

(1989, p.115) suggests that one of the ideological contradictions created by ERA was the tension between local and central control, yet central control is much higher in Cyprus than in England (Chapter 3). Cypriot teachers did not disagree with following a fixed sequence of teaching topics and having a fixed teaching time. Their perceptions of these two issues of curriculum organisation can be attributed to the fact that they had never had different experiences. Likewise, their doubts on whether schools should be able to decide about their policy in teaching and assessment in Mathematics (Item 17) and to appoint other adults to help teachers (Item 36d) are similarly explicable.

Second, the effect of central control upon Cypriot teachers' perceptions can be also seen in the strong consensus among the perceptions of Cypriot teachers about active pedagogy. This can be attributed to the fact that the notion of "good practice" is presented to Cypriot teachers as unproblematic. Neither tutors of Pedagogical Academy (ITT) nor tutors of Pedagogical Institute (INSET) or inspectors made explicit that "good" implies questions of values and that the notion of "good practice" may raise controversial questions about the claims made for particular methods, the evidence for and against them, or the practical problems of implementing them. The consideration of "good practice" as unproblematic is reinforced by the lack of any research and educational debate in Cyprus (p. 122), and the fact that teachers' appraisal is conducted on the basis of teachers' ability to put into practice the active pedagogy. Thus, teachers' and inspectors' focus is upon teaching methods and classroom

organisation rather than pupils' learning. The fact that learning is the end and teaching methods the means is ignored. It can be therefore claimed that the situation with Cypriot teachers is similar to that in Leeds LEA identified by Alexander (1992, p. 86) who describes it as follows:

> "despite the ostensible commitment to 'flexibility' there was apparently just one version of 'good practice', presented as a package of recommendations and principles and exemplified in the model classroom. This was viewed by teachers as having the force of policy and therefore being not open to challenge"

This argument raises a significant question about whether Cypriot teachers who agreed with active pedagogy did so because they felt it was expected of them. And if so the validity of this study cannot be measured by comparing their responses to two different methods, since it is possible that responses to both of them were invalid (see p.371 below). On the other hand, it is possible that some of the teachers agreed with these principles but they did not realise the implications of these principles for their classroom practice. This has to do with the inadequacy of current educational language in its attempt to deal with the complexities of discovery learning (Richards 1975, p. 94). Pupils of teachers of any of these two groups may gain rather less than if they had experienced a more varied mode of discourse (Alexander 1992, p. 88).

Finally, Cypriot teachers' responses to items 33 and 34 of the questionnaire, concerned with perceptions about influences on their practice, revealed the strong effect of the state upon classroom practice, and teachers'

perceptions. This strong influence was exercised upon Cypriot teachers' practice through policy documents and inspectors, a conclusion which does not match with the data gathered by Taylor et al (1974) about English teachers of the 1970s. Taylor et al (1974) showed that the schools were influenced only a little by the government, and that this influence was organised into a single, clearly defined sub-system ("Administrative or Bureaucratic influence"). The autonomous decision-making of the individual teacher over his/her own classroom was the most important influence with that of the head and the pupil moderate. However, Cypriot teachers were influenced more by the "political" factor (Inspectors and documents) than by the "professional" (Head and Colleagues) or the "consumer" (Pupils and Parents), irrespective of the cluster group to which they belonged (Table 5.9). Taylor et al (1974) argue that:

> "whatever is the truth of the matter, the evidence, tentative though it is, suggests that neither the school nor the individual teacher is by no means entirely free to decide what to teach and how to teach it and, though the head teacher's influence is strong and that of the teacher over what is taught in the classroom even stronger, neither influence is likely to be exerted in total independence of the views and opinions of the public at large, and of the teaching profession at general" (p. 23)

It can be claimed that Cypriot teachers are even less free than English teachers to decide what to teach and how to teach it since inspectors and policy documents influenced them strongly. This strong influence may be attributed to the model of curriculum change used in Cyprus (Chapter 3) and especially to the fact that the content of the curriculum is specified by a national curriculum, active

pedagogy is considered as "good practice", and teachers are appraised on the basis of their abilities to put this pedagogy into practice.

The influence of the state upon perceptions can also be seen in the extent to which teachers wanted these items to influence their practice. Since they wanted inspectors and policy documents to influence them strongly, it can be argued that they accepted that the state should exercise control at the local level. It can be also assumed that even if Cypriot teachers had the opportunity to choose between a system with such control and one without they would choose the former. This was a finding identified across the various homogeneous groups created by cluster analysis. Only one group, consisting of five teachers, did not want any influence upon their practice other than pupils.

In addition, the interview data (p. 291) showed that teachers complained only about the kind of guidance provided from the state and they wanted more specific suggestions which they could put into practice rather than "theories" which did not help them to face their own problems with teaching Mathematics. It can be therefore claimed that the way the system is operating and especially the process of disseminating and diffusing curriculum change influenced their perceptions about teachers' role in the process of change. For them there was only one model of change, in that teachers were seen as responsible for implementing the policy, decided by external experts. Thus, the central control which is exercised upon Cypriot teachers encouraged

the development of an acceptance of "non-negotiable" aspects of teaching and assessment in Mathematics similar to that for the whole curriculum identified by Alexander (1992, p. 28) in Leeds.

2.2 The Lack of a School Based Curriculum Policy

It has been argued that there is no school based curriculum development in Cyprus and this idea is supported by the qualitative data (Chapter 6, and Appendix E). It has been also shown that although there is strong consensus among Cypriot teachers about teaching and assessment in Mathematics, there was no school effect in any of the five schools. Taylor (1975, p. 189) showed that there was a higher level of consensus in some English primary schools than in others and this was attributed to the effect of the headteacher who induced teachers to emphasise a particular set of aims. In addition, Rosenholtz' (1989b) study about the social organisation of American schools revealed that this high consensus among the staff of the schools was associated with the development of shared school goals. These five research schools had not developed any school policy (Appendix E, Chapter 6), irrespective of whether they had a high percentage of pupils with learning difficulties or high attainers and this seems to be the reason of the lack of differentiated consensus in perceptions among teachers of each particular school (Chapter 5).

It should be, however, acknowledged that although the degree of influence of heads was lower than the influence of

inspectors and policy documents, it varied between individuals since the two heads who were specialist in Mathematics influenced their staffs more than the other three. This is a common finding with American teachers and is attributed to the fact that the salience of selected curriculum influences is partly a function of their physical and psychological proximity to the teacher (Rayder and Body 1975, Ross 1980, p. 221). In addition, Bredo (1977) discovered the same variation and related it to the extent to which heads were involved in instructional tasks and actively participated in the teacher's work. Both the questionnaire and the semi-structured interviews (p. 285) with Cypriot teachers suggested that teachers were prepared to allow their heads to enter into the central tasks of instruction. (see p. 286) In addition, teachers' comments revealed their respect for those few heads who supported their efforts to teach and assess in Mathematics.

The questionnaires revealed that although teachers accepted heads' influence, this influence did not make any significant contribution to their confidence in teaching or assessment in Mathematics. For instance the influence of head of "School A" upon his staff was significantly stronger than other heads but staff of "School A" did not feel more confident to teach or assess in mathematics than teachers of other schools. The interviews (p. 286) revealed that although teachers wanted heads to influence them in the central task of instruction, heads spent more of their time on their administrative duties than on supporting teachers. Thus, teachers had little contact with their heads and what there

was was mainly concerned with events outside the classroom, relating to issues like timetable organisation.

The lack of any school based curriculum development and the highly centralised system of Cyprus have another effect upon the perceptions of most of the teachers. Although they acknowledged (see p.298) that schools should have their own policy, their views about school based curriculum policy were restricted to some aspects of instruction like deciding about the content of the curriculum and the basic curriculum for each year group. The fact that tasks like setting objectives, developing instructional strategies and selecting learning materials were not mentioned can be explained by the fact that the government, not the school, is responsible for these tasks. However, they expressed their willingness to share successes as well as concerns with their colleagues (see p. 300). This matches with one of the characteristics of the schools who developed a collaborative culture identified by Nias et al (1989, p. 62) defined as "Valuing Interdependence: Working as a team".

Nevertheless, it was not possible to identify such interdependence among the staff of any of the school as a whole, but only between teachers who had to teach classes of the same year group (Chapter 6). Ross (1980, p. 220) argues that teachers have little contact with other teachers because there is a tendency to be separated into "single cells of instruction" and hence there is low task interdependence. This is particularly true for Cypriot teachers who have to take decisions on how to put into

practice an age-related national curriculum and the concern of each teacher is how to manage to teach it to her pupils. It can be therefore argued that Cypriot teachers of these five schools were members of sub-groups which were developed according to the year group of the pupils they had in their classes. They also placed greater value on their sub-group relationships than on their relationships within the wider staff group. It has been argued above that such unequal valuing of colleagues inhibited the development of a single staff culture (p. 87). In this way, an age related national curriculum may act as a barrier to the development of a whole school staff culture.

2.3 The special characteristics of classes where teachers have to work: Class-Based Focus

The statistically significant differences between perceptions of groups of teachers according to the characteristics of their classes can be linked to the argument, provided above, that there are some special groups among the sample of Cypriot teachers. Characteristics which define these groups were the number of age groups in their classes, the year group of their pupils and the size of their classes. They are class focused. In a publication of the Schools Council, it is suggested that

> "Differences that occur from class to class, and even from pupil to pupil within a class are in the particular topics chosen for study, the methods of study employed, the weight given to each part of the curriculum and to the level of difficulty to which each part is taken. There are good reasons why, to some extent , this should be so."(Schools Council 1986, p. 173)

This seems to support the above finding and provides some explanation for the fact that although each group had a fixed membership there was an overlap between groups. For instance, teachers who had to teach classes with similar sizes have the same perceptions about some issues but may have different perceptions about other issues if they had to teach pupils of different year groups.

In addition, the statistically significant differences between perceptions of groups of teachers about policy issues imply that these issues could be debated at a meeting of a representative group of teachers and by reference to these groups. For instance, the policy recommendation for pupils' self-assessment which is promoted by the government of Cyprus is an issue which could be debated. Blyth (1990a, p. 72) referring to the assessment policy in European countries reveals that "In a few instances, including those of Cyprus, the Netherlands and Switzerland, mention is made of the importance of children's self-assessment". It has been however shown that there is no consensus among Cypriot teachers about this assessment method and variation in teachers' perceptions had to do with the variation in pupils' ability and age. Class size was also found as associated with perceptions about this assessment method. It can be therefore argued that there is a need for a flexible policy on pupils' self-assessment. Crandall et al (1986) argued that:

> "The essential question for teachers is not who created the program, but whether it measures up against the

> tests of reality and utility - that is, whether it makes sense to them, and whether it will help them and their students" (p. 27)

Such an assessment method will neither make sense to some of the teachers nor it will help their pupils. Thus, assessment policy should be differentiated and not be part of a requirement for all the teachers irrespective of their pupils' abilities or the problems which they have to face in their classroom. This reveals doubts about the effectiveness of a national policy which does not take into account these differences and is not flexible.

These differences in perceptions among groups of teachers should be taken into account by attempts to produce policy guidance and materials for teachers. This is illustrated by the fact that textbooks, Triminiaia and the New Curriculum were not used as frequently for planning mathematics teaching by teachers of more than one year group and teachers of Year 1 as by other teachers. Thus, there is a need for adopting a flexible national curriculum and assessment policy which will be able to influence the policy which particular schools can develop. A school policy will also be able to influence the policy for each class in the school. This suggestion is in line with the argument provided at the review of the literature indicating that the development of various sub-groups in a school is not necessarily an "enemy" (Nias et al 1989, p. 44) to the attempt of the school to develop a common policy.

Cypriot teachers' focus upon their classroom can be also seen in their consideration of pupils as a significant

source of influence upon their practice. Although this can be partly attributed to the policy commitment on aspects of "child-centred" approaches, it can be also attributed to the fact that teachers' instructional tasks like the setting of daily objectives and selecting of learning activities are carried out according to their pupils needs. The latter explanation seems to be more likely since there is no significant relation between pupils' influence and either inspectors' or policy documents' influences. On the contrary, a negative relation between the "consumer" influence (parents and pupils) and the "political" influence (inspectors and policy documents) has been identified

2.4 The effect of parents and pupils upon teachers' perceptions

Doherty and Travers (1984) argued that there was no great desire of English teachers for a high degree of control over the content of their curricula. It was also argued that:

> "This presents an interesting contrast to the official view of the teachers' unions, in their reactions to the Taylor Report ('A new partnership for our schools'): this report which sought to widen the control of the curriculum to include such agencies as school governors, was condemned by the unions. They maintained that the school curriculum was, and ought to be controlled by teachers" (Doherty and Travers 1984, p. 204).

Evidence about Cypriot teachers' perceptions of the items which they wanted to influence them did not show that they wanted to be free to determine their class-based curriculum. However, they did not want parents to influence them. It can be therefore argued that Cypriot teachers will react

similarly to English teachers to a policy encouraging a strong influence of parents upon their curriculum practice.

The interview data (p. 282) revealed that parents rarely visited teachers to ask about their pupils' progresses. Thus, teachers expressed disagreement with the idea that parents should exercise strong influence upon their practice and revealed that parents did not influence them. This was a common finding for schools where parents were not well educated as well as with those where parents were well educated and could help their pupils (see p. 283). It can be therefore argued that this lack of involvement of parents with schools was irrespective of parents' socio-economic background. Moreover, there was no school policy in the five schools about parents' participation and this can be linked to the fact that neither parents influenced teachers nor teachers wanted them to influence their classroom practice. Furthermore, the interview data revealed that although teachers did not want parents to influence their practice, they complained at the same time that parents did not visit schools to discuss their pupils' progress. This finding is supported by Rosenholtz' (1989b, p. 109) argument that "the more teachers complain about uncooperative parents, the more they tend to believe there is little to do".

A negative relation between the influence of the state and home was identified. This raises doubts on whether the management of change can be achieved through a development of collaboration between school, state and home. This negative relation may be attributed to a conflict between

the requirements of the curriculum policy (New Curriculum) and the requirements of the class-based curriculum. It may also reflect teachers' dilemma on whether their efforts should be focused upon the whole class rather than upon the needs of individual pupils (see p.279). Thus, it can be claimed that there is not only a need for finding ways of fostering more effective home-school collaboration (Tizard et al 1988, p.188) but also for fostering more effective home-school-state collaboration. Fullan (1992, p.3) argues that such collaboration is essential since no one group can make all the difference on its own. This argument is supported by research showing that teachers working with parents may come to understand better their pupils, bring about unique rather than routine solutions to classroom problems (Ashton et al 1983), and reach to a shared understanding (Epstein 1986, 1987). Moreover, Rosenholtz (1989b) argues that

> "Where teachers work with parents toward achievable ends and realize some benefits from their efforts, they may experience greater certainty about their technical culture" (p. 109)

Thus, a more explicit policy on collaboration between state-school-home should be developed in Cyprus. Alexander et al (1992, p. 97) identified a similar conclusion for the curriculum policy of Leeds LEA and argued that "there was a need for policy which could stipulate not just goals and commitments but also a range of procedures from which schools will be able to choose". The lack of such policy in Cyprus is in contrast to the fact that the state has been interventionist on issues of teaching methods which might be

thought as the professional responsibility of teachers. Implications of these perceptions for Cypriot teachers' occupational culture are discussed below (Section 3).

2.5 The effect of professional training upon teachers' perceptions

a) Initial Teacher Training

Little information is available relating to the effects of professional training upon teachers' perceptions (Cook et al 1951; Evans 1958; and 1965, p. 9). Steele (1958), who tested student teachers at the beginning of their course, at the end, and after six months of full-time teaching, found an intensification of "progressive" attitudes during training, (quoted in Butcher 1965, p. 18). Borko et al (1987) provided the same message. Kyriakides (1992) also showed that Cypriot student teachers' perceptions were partly influenced by their training and especially the pedagogical practices promoted by it. The comparison in this study between perceptions of Cypriot beginning teachers when they were at the end of their training and when they were at the end of their first year of experience revealed that their educational ideologies had not dramatically changed from the previous year. Similar conclusions were derived from comparison of perceptions of graduates of Warwick University when they were at the end of their training and when they were at the end of their first year of teaching experience (Chapter 5, section 2.4). Thus, it can be claimed that initial teacher training influences teachers' perceptions and the perceptions which are developed do not change during the first year of teaching experience.

However, it was not possible to identify any difference when length of teaching experience was controlled and perceptions of teachers who had more than 20 years of experience were compared according to the kind of the initial teacher training program they attended. Nevertheless, it is probable that the effect of this training has diminished since it happened twenty years ago. It was also not possible to control changes on the effects of other factors influencing teachers' perceptions during these twenty years. A typical example of such changes is the fact that curriculum policy and ITT in 1960s did not encourage the active pedagogy. Thus the perceptions of good practice held by teachers who have more than 20 years of experience have changed irrespective of whether they attended three or two years ITT programme.

Despite methodological limitations of these comparisons on both theoretical and practical grounds, it can be argued that the evidence presented earlier suggests that initial teacher training had some influence upon teachers' perceptions, at least while they were student teachers and beginning teachers. It is however important to note that a comparison between Cypriot teachers' perceptions according to the initial training courses they attended (Kyriakides 1992, see also p. 217), did not reveal any statistically significant difference about perceptions of curriculum organisation, management of change, and influences on practice. This can be attributed to the lack of any initial teacher training course related to the theories of curriculum change and the acceptance of the centre-periphery

model by both PAC and University of Cyprus (see pp 96-99). Thus, the need for offering such courses at the University of Cyprus should be examined in terms of their contribution to altering teachers' perceptions about the process of curriculum change (see section 4.3).

b) Specialised Mathematics Courses (ITT AND INSET)

Comparisons between perceptions of teachers who attended specialised Mathematics courses at PAC (ITT level) with those who had not attended such courses did not reveal any statistically significant difference. Similar comparisons between those who attended such courses at INSET level and those who had not attended also showed that there was no statistically significant difference between perceptions of these two groups of teachers. This suggests that the teachers' perceptions are framed in a general, rather than a subject-specific, policy perspective.

c) Compulsory In-Service Training (EPIMORFOSE)

Comparisons between perceptions of teachers with less than 10 years teaching experience who had attended the compulsory INSET course offered by the state when they answered the questionnaire and teachers with less than 10 years of experience who had not attended it showed that there was no statistically significant difference between perceptions of these two sub-groups about teaching and assessment in Mathematics. Moreover, attendance at these courses did not have any effect on how confident they felt to teach or assess in Mathematics. Both groups of teachers did not have different perceptions about the requirements of the New

Curriculum but both of them believed that it was too intellectually demanding for their pupils. Finally, these two groups of teachers did not have different perceptions about either the influences on their practice or the current curriculum reform. These findings can be attributed to the fact that these courses are not focused on issues relevant to curriculum theory and links between INSET and curriculum policy are very weak in Cyprus (Chapter 3). Taylor (1991, p.65) suggests that:

> "Many recent statements about teacher education fail to recognise the changes that have already taken place as a result of stimulus provided by, for example, HMI reports, the introduction of the National Curriculum".

However, it is even more difficult to identify similar changes in teacher education in Cyprus as a result of the current curriculum reform despite the fact that inspectors in Cyprus are able to control teacher education to a higher extent, than can the DES in England (Chapter 3).

(p.292)
The interview data revealed also teachers' dissatisfaction with such courses. Young teachers especially mentioned that they had high expectations but they were not helped by these courses. This is in line with the questionnaire data about perceptions of INSET which show that the great majority of teachers believed that INSET should be focused upon practical problems which teachers have to face in their classroom. Thus, there is a need for INSET provided by the Pedagogical Institute, focused on issues raised by the current curriculum reform, and also school-led INSET focused on the practical problems. The dangers of a "closed-circuit"

INSET whereby schools reinforce their inadequacies should be taken into account (Alexander 1992, p.199). However, the interview data (p.292) revealed another danger, namely the dangers of a government-provided INSET which did not help individual teachers to solve their own particular problems. For these reasons, and especially at a time of change, a mixed economy of in-service training is essential to integrate teachers' development with their perceptions. Further suggestions about policy on INSET and how this can have implications for changing teachers' occupational culture are provided below (section 3.3).

2.6 The effect of length of teaching experience upon teachers' perceptions

Comparisons between perceptions of teachers who had less than 10 years of experience and those who had more than 10 years of experience revealed statistically significant differences. These were similar to those of beginning teachers and the general sample of Cypriot teachers. Further exploration of these differences has shown that there is no statistically significant *difference between perceptions of* beginning teachers and perceptions of teachers with less than 10 years of experience. The differences between beginning teachers and the general sample mainly arose from the perceptions of teachers with more than 9 years of experience. This finding implies that although the length of teaching experience was associated with the development of teachers' perceptions, it did not have an immediate effect upon teachers' perceptions. This is supported by the fact that perceptions of both English and Cypriot beginning

teachers did not dramatically change in the year since the end of their training.

Having in mind all the statistically significant differences (presented in Chapter 5) it can be claimed that young teachers tended to agree with more "progressive" opinions (eg perceived importance of purposes concerned with the development of positive attitudes to Mathematics) than older teachers. These differences can be linked to findings of earlier research which has shown, (Ferguson 1942, Callis 1950, Eysenck 1947, Ashton et al 1975, Simon 1986, p. 16), that younger people are more 'progressive' and humanitarian in general than older people. This finding can be also linked with Delamont's (1987, p. 11) argument that research shows that "the younger, less experienced teachers were more favourable to progressive ideals than the older more experienced teachers".

Second, more younger teachers wanted to be more autonomous and not to be influenced by either the "state" or the "home" as much as older teachers. However, they wanted to be more influenced by the "school" than older teachers. This implies that younger teachers are more committed to the development of their own professionalism, and at the same time they may accept more readily any movement toward school based curriculum development. This difference among the teachers is associated with the length of experience, but the length of experience itself is influenced by differences in the system over periods of time and especially by the fact that the educational system in Cyprus was even more centralised

in the 1970s and early 1980s than in the late 1980s and 1990s.

Finally, more experienced teachers organised their classroom in such a way that their pupils spent less time in working as a whole class and more time on collaborative tasks. In addition, their planning was not dependent so much on textbooks as that of younger teachers. This can be partly attributed to the fact that they have found out ways to diminish the gap between theory and practice since there may be some association between experience and professional development. It can be also attributed to Pollard's (1980, p.39) argument that "the tension between idealism and pragmatism is often resolved, especially as careers lengthen, in favour of the latter".

Evidence gathered from this research helps us to expand Dale's (1977) argument that there are three different sources that underpins teachers' professional knowledge; the view they gain of the process of teaching as a result of their experiences as pupils, their professional education and their ongoing teaching experience. At least the latter two influenced Cypriot teachers' perceptions.

3) TEACHERS PERCEPTIONS, PROFESSIONALISM AND CURRICULUM CHANGE

This section attempts to examine further the argument that curriculum change should not be only about changing either the content or the structure of the curriculum but about

teachers' professional culture. Metzendorf (1987, p. 3) criticises efforts to improve teaching which have been made predominantly from outside the teacher, ignoring the teacher as person. The data about Cypriot teachers' perceptions raise implications for their occupational culture which can be linked with theories of curriculum change and especially those dealing with changes which have an organisation focus (Crandall et al 1986, p. 25). For this reason, findings concerning Cypriot teachers' professionalism which have implications for the process of change are discussed in this section. Its first and second parts (Sections 3.1 and 3.2) are concerned with teachers' role in the process of change at national and local level respectively. The third part deals with the contribution of reform of teacher education for changing teachers' occupational culture and thereby the process of change. However, the final part of this section (3.4) shows that there is little coherent culture among Cypriot teachers and this reveals the complexity of identifying strategies for curriculum change in Cyprus.

Teachers' professionalism

First of all, it is important to deal with the meaning of teachers professionalism. Acker (1987, p.87) points out that "teaching is one occupation treated rather grudgingly by sociologists seeking to establish which are or are not 'professions'". Etzioni (1969) considered teaching as less than full professional status, as a "semi-profession", and attributed that to the fact that teachers' training is shorter, their right to privileged community less established, there is less specialised body of knowledge,

and they have less autonomy for supervision or societal control than doctors or lawyers. It is however clear that significant progress towards English teachers' professionalisation has been achieved (Hoyle, 1983). Nevertheless, Hoyle (1990) comments:

> "In the 1980s a number of government policies were introduced which could have consequences for the professionalisation - or de-professionalisation - of teaching. It is difficult at the present time to assess unequivocally the full implications and these ... partly because the full implications for the profession will only become clear during the 1990s"(pp 13-14)

This reaction to the current curriculum reform in England shows that changes in the process of curriculum change may have implications for teachers' professionalism. However, such reaction to curriculum reform is not reflected in Cyprus where professionalism is weak. Only recently Cypriot primary teachers' training became equivalent to a University degree and there was an attempt to link that with increase of primary teachers' status. However, their role in the process of change has not changed. Thus, implications of the research data for Cypriot teachers' professionalism and for the process of change are illustrated below.

3.1) Teachers' role at the development of curriculum policy

Fullan (1993) suggests that neither centralisation nor decentralisation works. Centralisation errs on the side of overcontrol, decentralisation errs towards chaos. Analysis of the strong influences of the state upon Cypriot teachers' perceptions identified from their responses to item 33 of

the questionnaire can be attributed to the fact that they were neither free to decide what to teach Mathematics nor how to teach it. Lee (1987, p. 110) argues that "whilst the content of education may have been challenged, the control of the education by the ideological apparatus of the state has not been significantly challenged". It can be argued that there is a need for a reconceptualisation of teachers' role in the process of change. The need for encouraging teachers' involvement in both policy formation and evaluation can be seen in terms of the following four issues.

First, the recent US discussion of teacher empowerment (Maeroff 1988) in which empowerment is meant as giving teachers more power in order to make them more professional raises a significant question for Cypriot teachers' role in the process of change. The question is whether encouraging teachers to become curriculum developers will contribute to the achievement of change and at the same time to teachers' empowerment. Although Martin-Knier and Uharmarcher (1992) show that teaching and curriculum development require different kinds of skill, working styles and background knowledge, they argue that:

> "engaging in curriculum development presents teachers with numerous advantages that can result in increased professionalism, self-understanding and knowledge. Because of these advantages, we argue that teachers should have greater opportunities to develop curricula" (p. 270)

On the other hand, Young (1979) shows that not every teacher is inclined to write or create curriculum materials.

Evidence from the questionnaires and interviews in this study support Young's argument in that Cypriot teachers did not object to the way curriculum change was brought into their schools. However it does not follow that change should be left to the "experts" (Fullan 1993), since innovations and reform have to pass through teachers' culture (Hargreaves 1980, p. 125).

Second, the need for involving teachers in the process of curriculum change can be seen in terms of the main difficulties with attempts to change the curriculum in Cyprus which are not due to teachers' resistance (see section 1) but due to the lack of teachers' autonomy. Many teachers may agree uncritically and superficially with curriculum policy because they feel that this is what they are expected to do (section 2.1). However, Pascale (1990) observes that ideas acquired with ease are discarded with ease. Thus, the weakness in current curriculum reform in Cyprus may lie in the way it is brought about which encourages a belief that getting on is mainly a matter of saying and doing what significant others (ie inspectors) wish to hear and see (Alexander 1992, Chapter 6). As a consequence, teachers fail to develop their professionalism through this process of unthinking conformity.

A typical example of this is the strong consensus among teachers about "good practice" in teaching Mathematics. Their perceptions are in line with suggestions provided by the state. Alexander (1992, p.145) argues that "Good primary practice must cease to be presented as an uncontentious

absolute". However, good practice is not presented by the Cypriot policy documents as conceptually and empirically problematic. And since policy documents influence teachers strongly, simplistic perceptions of teaching are developed. It can be therefore suggested that much more account should be taken by policy makers of the individual teacher in discussing classroom practice. This may have implications for changing the philosophical assumptions about Mathematics pedagogy promoted by the policy documents. Moreover, a change of teachers' culture by promoting their involvement in the process of policy formation about teaching and assessment in mathematics could affect their own perceptions about teaching Mathematics.

Third, the idea that the officers of the Ministry of Education can be the sole definers, arbiters and guardians of good practice encourages professional dependency. Teachers might be involved in the policy formation and evaluation, and thereby the management of curriculum change will be based on the professional rather than contractual accountability (see p. 113). The new role of teachers should encourage both professional autonomy and self-motivated development which have been seen as significant sources of curriculum change (Howson et al 1981, p. 5; Barnett 1953, p.156). Lowther et al (1984, p. 281) claim that their study indicated that increased job responsibility may be more potent in changing teachers' attitudes toward their worklife than monetary incentive alone. However, the Cypriot Ministry of Education seems to provide the latter alone to increase teachers' status. Research findings revealed teachers'

dissatisfaction with inspector's involvement in their work. In addition, the fact that younger teachers do not accept the state's control as much as older teachers do might be also linked to their disapproval of curriculum control by inspectors.

Finally, the need for a reconceptualisation of teachers' role in the process of curriculum change in Cyprus derives from findings concerning the class-based focus of teachers' perceptions. These findings reveal the difficulties a national policy has in dealing with both the needs of each school and the needs of different groups of teachers. Suggestions for a class-based and school-based curriculum, areas of weakness in the centre-periphery model, can therefore be seen. These are in line with Richards' (1982) suggestion that "there is a need for curricula to be responsive to the necessary differences in pupils or localities" (p. 51). This approach advocates the need for both national and local curricula, a view indirectly supported by the current policy in England (DES 1980, p.2; and Chapter 3) where the common policy for the curriculum is considered neither as a prescription of uniformity nor as taking all children through identical syllabuses and teaching them by the same methods. This co-existence of national, school and class based curriculum may enable each level of curriculum to get feedback from the others and is also necessary for having evaluation treated as a part of the process of a continuous change (Day et al, 1990).

Thus, the implications for the teachers' role in curriculum policy is to treat policy critically and to find ways of communicating their views to inspectors. Teachers might move from passively receiving material from the inspectors to treating it critically and being responsive to it by providing their views and judgements for it. This would have implications for changing their culture and promoting teachers' professionalism.

3.2) Teachers' role for the development of a school based curriculum policy and for a collaborative culture.

This study has argued that each Cypriot primary school might develop its own school policy which could be based on the ideology promoted by the national curriculum and the special needs of the school. This need was shown in the review of the literature and by the difficulties for any national curriculum attempting to meet the needs of the different groups of teachers (Section 2). However, both the questionnaire and the interview data revealed that there was not any school based curriculum policy in Cyprus and that teachers worked in relative isolation.

(p.300)
Moreover, the interview data supported the argument provided in the review of the literature indicating that the development of a collaborative culture would contribute significantly to the development of an effective school curriculum policy (p. 86). Such a cutlture could help teachers to value not only the individual's contribution to others but also their interdependence (Nias et al 1989). It is the development of such a culture which is able to

support teachers and to contribute to the improvement of curriculum practice. Thus, the current curriculum reform in Cyprus is very likely to fail to improve teaching and assessment since it has failed to address the associated development of new collaborative cultures among teachers and between teachers and the "state". The first part of this section is concerned with the lack of a collaborative culture among Cypriot teachers by examining four aspects of teachers' working conditions.

First, data about interaction in five Cypriot schools revealed that there was very rarely interaction concerned with professional issues among the staff of these five schools (Chapter 6, Appendix E). It has been argued above that the isolation of teachers and their work demands affect attempts to develop a collaborative culture (p.87). This influences the process of curriculum change followed in Cyprus.

Second, barriers to the development of a collaborative culture can be also attributed to the fact that primary heads and teachers are members of an occupation which traditionally sets much store on its members' ability to control pupils and which is hierarchically structured. Teachers exercise authority over others but are authority-dependent (Nias 1987). This is particularly true for teachers in Cyprus due to the fact that curriculum development was construed simply as the introduction into schools of externally designed curricula developed by the officers of the Ministry of Education. The fact that

teachers are authority-dependent and teaching is hierarchically structured can also be seen by taking into account research findings concerned with the strong effect of the state upon their perceptions and classroom practice.

In addition to the hierarchical structure of teaching, interview data (p.302) showed that heads did not find time to talk to teachers, due to their administrative duties. Thus, interaction between Cypriot teachers and between teachers and their heads is limited. (see p.304) And since professional interaction was seen as crucial for developing collaborative culture (see p.87), such cultures are hard to develop in Cyprus, especially given the limited role of the heads.

Finally, the questionnaire revealed that although there was not any particularly strong consensus among teachers of each of the five schools, there were statistically significant differences between perceptions of groups of Cypriot teachers according to the characteristics of the classes they had to teach. It can be therefore claimed that there is a class-based but not a school-based focus amongst Cypriot teachers. This reveals a barrier for developing a collaborative culture since it has been argued above that the development of a single staff culture is inhibited if teachers place greater value on their sub-group relationships than on their relationships within the wider staff group (Chapter 3). Thus, there is a need for developing a flexible school curriculum in each Cypriot primary school which will then enable each teacher to develop his/her own class curriculum. Although the school

creates various social contexts since different teachers are, in theory, able to bring about different world views (Hargreaves, 1972b), a coherent school policy is also needed. What happens in schools should reflect the needs of the society, the special needs of the school and finally the changes which are created for the individual teacher and his\her own pupils. This implies that there is not only a need for having national, school and class based curriculum but also an interaction among them (see below p. 364).

Changing teachers' culture to establish School Based Curriculum Development in Cyprus

Analysis of teachers' working conditions shows that there is a need for developing a school based curriculum policy (see p.29: Attempts for developing curriculum policy at the local level might be seen in terms of the following changes in teachers' culture. First, each teacher might value the individuals and the various groups of teachers which may exist in his/her school. Teachers might also attempt to learn from the differences which they can identify in their schools without becoming "enemies" of the attempt to develop a flexible culture of the whole school. Similar suggestions were provided by the symposium of the council for cultural co-operation about "The Management of Innovation in Primary Education" (Council of Europe 1984). Cyprus participated in this symposium and shared the idea that increased internal communication positively influenced the implementation of an innovation. It was argued that teachers might have the opportunity to share ideas about pupils' reactions, about the use of materials and about teaching strategies (Council of Europe 1984, p. 7). This research showed that Cypriot

policy makers, teachers and heads needed to realise that such internal communication in the schools is necessary for the effective implementation of curriculum policy.

Second, teachers might find new ways of doing their job in the school in order to be able to help their colleagues. Their job satisfaction could emerge from finding out that both their pupils have learnt and their colleagues have been helped. Their contribution to the professional development of their colleagues and to the development of the school based curriculum might be as important parts of their responsibility as teaching their pupils.

Finally, evidence on teachers' perceptions of influences on their practice revealed that parents and pupils did not significantly influence classroom practice. Moreover, research evidence show that although Cypriot teachers complained that parents are not interested about their pupils' progress, they did not agree that parents should be able to influence classroom practice. It has been however mentioned that a link between school and home (pupils and parents) may contribute to attempts of developing school based curriculum policy. Finally, the research shows that the link between home and school in Cyprus is problematic not only due to teachers' disagreement with the influence of parents and pupils but also due to a lack of an explicit curriculum policy on home-school links at the national level (Chapter 3). Thus, there is a need for further consideration of this issue from both teachers and the state by taking also into account parents' perceptions of their role for

children's educational life since curriculum change does not depend only on teachers' perceptions but also on the joint efforts of families, pupils and schools.

3.3) The role of professional training and the process of curriculum change

The identification of professional training as a possible factor influencing teachers' perceptions, shown by this study, suggests that professional training plays a significant role for changing teachers' culture. Its role can be seen in terms of Fullan's (1985, p. 396) argument that change at the individual level is a process whereby individuals alter their ways of thinking and doing. Curriculum change is also a process of developing new skills and above all of finding new meanings and satisfaction in new ways of doing things (Marris 1975). Thus, seven implications for curriculum policy about the role of professional training in the process of curriculum change are discussed below. In addition, the interrelation between professional training and process of curriculum change is shown.

First, this research shows that neither the general sample of Cypriot teachers nor beginning teachers feels confident about teaching and assessment in the New Curriculum. This finding can be linked with McPherson and Payne's (1987) investigation where it is suggested that ways must be found to overcome teachers' uncertainties. Moreover, Oteiza (1984) suggested that there is a need for match between classroom pedagogy and the pedagogy of the training courses:

> "The teacher should be required to learn Mathematics in a way in keeping with the methods which it is intended that he or she will apply. If, for example, he is to construct concepts with his students, he should first do this during the training". (p. 65).

This suggestion is in line with teachers' perceptions about INSET concerned with practice. In addition, the limited effect of both ITT and INSET courses on teachers' perceptions (Chapter 6, see also Meighan and Harber 1986) shows that the gap between theory and practice can not be diminished unless in-service training provides teachers with practical help in their attempt to implement curriculum policy (DES 1981, pp 21-23 and Proctor 1986, p. 151). Thus, the New Curriculum might be taken into account by those who are responsible for designing the University courses of Cypriot student teachers. Similarly, INSET might aim to inform teachers about curriculum policy and to deal with practical problems which teachers face with teaching and assessment in Mathematics. The latter aspect implies that INSET might be also linked with the school- and class-based curriculum (Section 3.2).

Second, teacher uncertainty may be also diminished if INSET aims to provide teachers with positive feedback, encouragement and personal responsibility. These ways of changing the culture of some of teachers' sub-groups will result in workplace commitment (Rosenholtz 1989b, p. 141). Maeroff (1988) claims that:

> Giving teachers greater power is a major way to make them more professional and to improve their performance. Professionals usually have a sense of

> authority about what they do and are recognised as experts in their fields. They feel good about themselves and are respected by others" (p. 4).

Third, the lack of a significant effect of both initial and in-service training upon teachers' perceptions has also been linked to the lack of any course related to curriculum change. Buss et al (1988, p. 252) reveal the need for teachers to be aware of the politics of curriculum change in order to perceive "the constraints operating" on their curriculum decisions. It can be therefore argued that INSET might aim to contribute to the establishment of teachers' professionalism in Cyprus and thereby to play a critical role in the process of change. Thus, courses which tend to overemphasise the expertise of those outside schools and to deny the legitimacy of the teacher as an expert need questioning.

Fourth, professional training should attempt to raise teachers' interest about curriculum policy and theories of curriculum change. It might develop positive attitudes towards teacher's new role as participants in the policy formation (Sections 3.1-3.2). Telling teachers what their new role should be is an easy task but it does not contribute to any change of their culture since it implies that the experts decide and teachers have to implement their decision.

Fifth, Wedell (1971, para 3.9) argued for INSET able to accommodate fundamental thought and debate about educational objectives and teaching methods rather than "be conceived of as a point from which educational orthodoxies are handed

down in ready-made packages". Although the Ministry of Education established the Pedagogical Institute (PI) in response to Wedell's (1971) study, such debate has not been promoted (Chapter 3). Policy-makers might realise that in-service training concerning debate about curriculum policy will improve teachers' professionalism and may encourage the implementation of policy in schools when teachers find its benefits for pupils' learning. Thus, professional training might not merely involve the acquisition of some knowledge and technical skills about the national curriculum but it might also attempt to encourage and facilitate teachers' reflection on experience (see also Johnston 1988, p. 222).

Sixth, an obvious contribution of professional training for changes on teachers' cultures has to do with the fact that professional training may enable, as Fonacier (1984) argues:

> "The more mathematically inclined teachers to become better exemplars, able to assist their colleagues by involving them in collective thought and constructive criticism of the teaching function" (p. 20).

Thus, the effectiveness of specialist Mathematics teachers can be explored, but this research shows that the courses currently offered do not affect teachers' confidence. Further consideration of these courses is needed.

Finally, professional training might not be only seen as a means to an end (change) but also as an innovation in itself. This could be easily done if INSET aims to implement new approaches into school. These approaches would emerge from the educational theory and curriculum policy. Jenkins

and Shipman (1976, p. 54) argue that educational theory influenced curriculum practice to a small extent and that its influence is mainly directed at teacher education. Thus, INSET might be influenced by theories underlying the national curriculum and at the same time attempt to influence local curriculum. Feedback from the local curriculum could be treated as a kind of evaluation of curriculum policy.

Thus, a reform of teacher in-service education could influence teachers' culture. However, the former could be also influenced by the latter. The strong link between implications of research findings for professional training and for process of change can be seen in terms of the interaction between school based INSET and school based curriculum policy. Teachers at a collaborative school value individuals and try to learn from their differences in order to develop multiple cultures (see p.87). Thus, the development of a school policy may contribute to the establishment of school based INSET. A collaborative school, as it has been argued above, is able to support attempts for developing not only a government-led INSET but also a school based INSET where teachers can diagnose and formulate their own (or school-related) problems. On the other hand, if the centre supports school based INSET, it may contribute to the development of a collaborative culture which is essential for changing the school ethos and developing a school policy. This is very important since the lack of such policy is one of the main obstacles for introducing an effective model of curriculum change. Such reform of in-

service training is essential for Cyprus, where in-service training is based on compulsory courses only (Council of Europe 1984, p. 4).

3.4) Perceptions of influences on practice

Although the questionnaire data revealed a strong consensus among teachers' perceptions of teaching and assessment in Mathematics, such consensus about perceptions of influences on practice was not identified. For this reason the cluster analysis was undertaken to identify homogeneous groups of teachers in terms of their responses to item 33 of the questionnaire. Thus, the grouping provided above was based on the source of influence on their perceptions. It was possible to identify not only the strong effect of the state upon their perceptions and the lack of any significant influence from parents, across the various homogeneous groups, but also the following six groups of Cypriot teachers (pp 194-197):

a) The "generally highly influenced"
b) The "generally uninfluenced"
c) The "contractually influenced"
d) The "vaguely influenced"
e) The "pupil influenced" and
f) The "policy influenced"

Obviously under some particular circumstances, like those of pressures from various factors in the environment of the group of teachers, sub-groups could develop, each with its

own kind of reaction to these pressures. Stenhouse (1975) suggests:

> "... as well as being a product of social action, culture is also a determinant of it. It determines who can talk to whom about what. We talk to one another by virtue of what is common in the cultures we have learnt." (p. 8)

Having in mind this argument and the identification of these six groups among Cypriot teachers, it can be claimed that teachers as a whole can not be treated as culturally similar. This implies that the notion of a coherent set of teachers' attitudes to change might be questioned. It can be claimed that some approaches to curriculum change will be more effective than others for different groups of teachers. Furthermore, most of the theories of curriculum change can be challenged. For example the suggestion for a link between teachers' professional development and curriculum change so that policy makers can work with teachers for their professional development and at the same time for curriculum change (Section 3.3) is not likely to work for some of the teachers. It can be also argued that the dissemination of a policy designed by the centre is less likely to work than the attempt for a school based curriculum development since the latter gives the opportunity to teachers and heads to take into account differences between the various sub-groups of teachers. Thus, this finding provides a further explanation for the failure of the centre-periphery model and reveals another reason for establishing a policy promoting school based curriculum development.

This finding reveals also a significant message for those heads who will try to become the "founders" of their school's culture (Schein 1985). They should not necessarily expect that their teachers will be influenced to the same extent or react similarly to their attempts to develop a collaborative school. Heads and teachers in a collaborative school might perceive the differences among the staff of a school as mutually enriching sources of collective strength (Nias et al 1989). They might be also able to value interdependence and to work as team and this can be linked to the fact that both school and class based curriculum is needed (see also section 3.2).

This finding can be also linked to the main assumption of this research based on the importance of teachers' perceptions for the effectiveness of any curriculum change. Research into teachers' perceptions of curriculum reform is able to provide evidence about the interests of the different sub-groups of teachers which can be used for the evaluation of curriculum reform (Section 5). Thus, relevant suggestions could be offered to inspectors, heads, and teachers who will try to develop a link between the state and the school as well as to heads, teachers and parents who may try to develop a link between school and home (p. 335). The idea of developing collaboration between home-school-state may not be seen as matter of developing legislation and/or sending policy documents to schools but of helping the various sub-groups of teachers to re-think the kind of interactions that takes place between home, school and state. It might be also acknowledged that teachers will

not react similarly to a policy on home-school-state collaboration. It is therefore important to take into account the differences in teachers' reactions to curriculum policy. This finding is discussed in the next section and leads to the suggestion for developing the network model.

4 STRATEGIES FOR CHANGING THE MATHEMATICS CURRICULUM

In line with other studies (eg Fullan 1993, Marris 1975, ESAC 1986), this research has shown that policy makers can not mandate change and that this is true for even a small country with a highly centralised system like that of Cyprus. This is partly due to the different needs which exist between and within schools. Moreover, sections 2 and 3 concerning factors influencing teachers' perceptions and their implications for the process of change raise doubts on whether either the state or teachers can be the sole definers, arbiters and guardians of curriculum policy. The fact that teachers support a specific opinion about teaching and assessment does not in itself mean that it should be incorporated into curriculum policy. However, this argument does not imply that policy makers should avoid taking teachers' perceptions into account. On the contrary, it implies that educational change can be achieved when people's attitudes change. Nevertheless, this is not an easy task (Fullan 1985). People's beliefs are part of a deeply rooted belief system based on perceptions of their role and which extends to social and political concerns. Thus, curriculum reform is complex (Fullan 1992, 1993, Fullan and Hargreaves 1992b) and a flexible approach to strategic

planning could be used to create shared visions between teachers and policy-makers.

This research supports the argument that curriculum change has to be based on a two-way relationship of pressure and support and continuous negotiation between the centre and the periphery which will amount to both "top-down and bottom-up influences" (Fullan 1993; Fullan and Miles 1992; Turnbull 1985). It can be therefore claimed that evidence gathered from this research provides support for an introduction of a new model of curriculum change in Cyprus and which may look like the figure 7.1 (p. 364a). This model is an heuristic device for examining the complexity of the process of change. Thus, the factors which influence teachers' perceptions and which are not taken into account by the current model of curriculum change in Cyprus are illustrated by dotted lines. This model is described briefly in the first part of this section and its relation to the current curriculum practice is illustrated in the second part. Finally, the third part of this section presents a short-term strategy of curriculum change which is an attempt to establish interactions among some of the factors of the new model which are not included in the current model.

4.1) The New Model of Curriculum Change

The contribution of this model to the process of curriculum change in Cyprus is partly in respect of the process of designing the national curriculum. Not only educational theory and research into Mathematics pedagogy but also

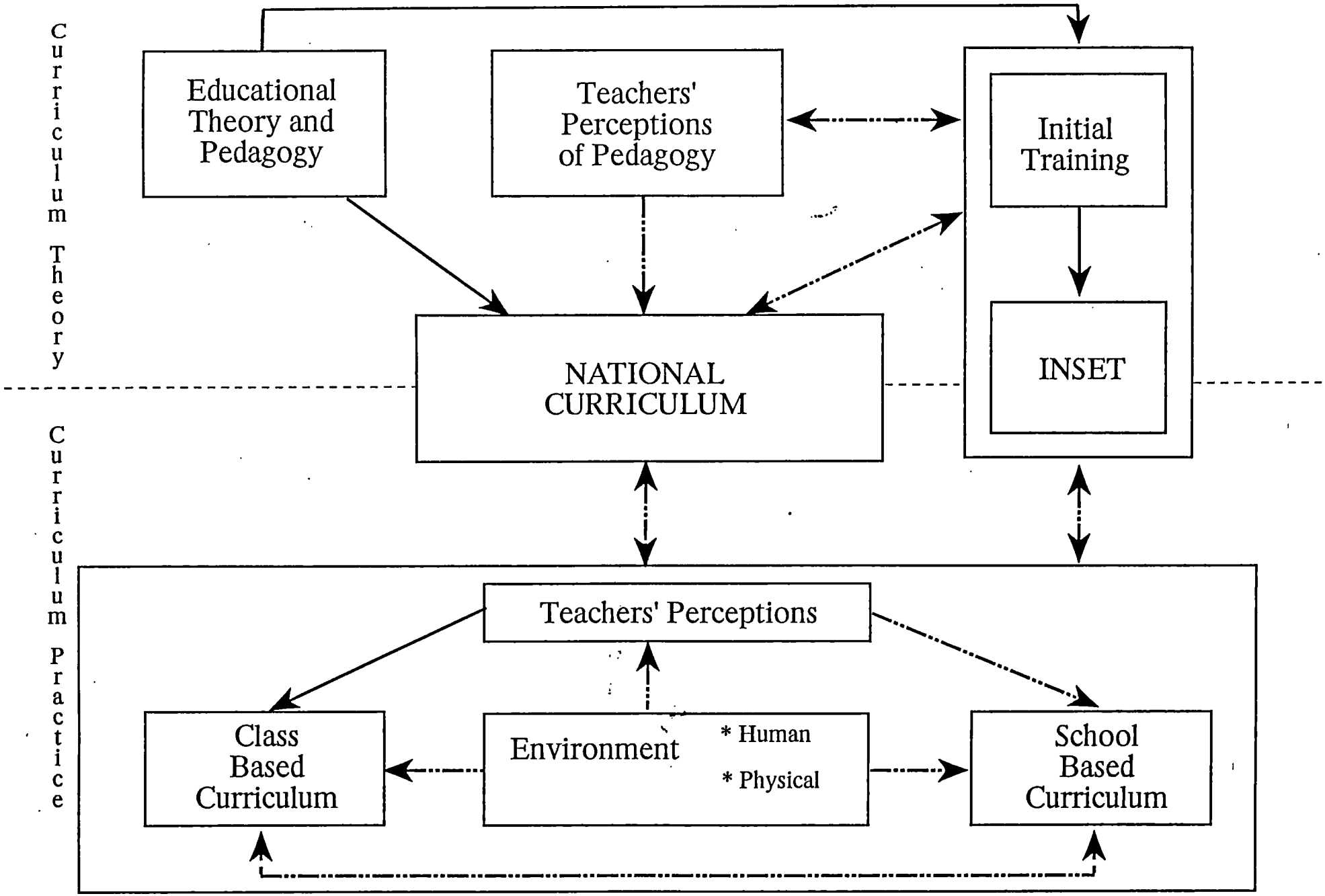


Figure 7.1: An heuristic model of factors influencing teachers' perceptions of curriculum change.

teachers' perceptions of educational theory should be taken into account. This model implies also that educational theory and teachers' perceptions could be factors for both creating the national curriculum and evaluating it by policy-makers. Such kinds of evaluation may diminish any authoritarian dimension of the educational system.

The model advocates the need for both national and local curricula. This assumption is supported by the fact that evidence of this study show that each primary school could develop its own school policy which might be based on both the special needs of the school and the ideology promoted by the national curriculum. And since each teacher might participate in curriculum decision-making at any level then an interaction between class-based, school-based and national curriculum will emerge. Moreover, research findings support the argument, provided at the review of the literature (p. 117), indicating that pupils and parents have to play a significant role in the process of change. The model supports the idea that curriculum change at the local level does not depend only on teachers' perceptions but also on the joint efforts of families, pupils and schools.

The identification of professional training as a possible factor influencing teachers' perceptions, shown by this study, suggests that initial and in-service training should be included in the model. A close relationship between initial and in-service training with the national curriculum is therefore required. This relationship can be seen in terms of the fact that the national curriculum should be

taken into account by those who are responsible for designing the University courses of Cypriot student teachers and those who are responsible for the INSET courses in Cyprus. In addition, INSET might aim to inform teachers about curriculum policy and to deal with practical problems which teachers face with teaching and assessment in Mathematics. Finally, this model illustrates an interaction between INSET and local curricula. INSET might be organised in order to influence local curriculum and at the same time to get feedback from the local curriculum about curriculum policy. Thus, evaluation of curriculum reform is not specified as a separate stage of this model but is represented by the interactions which should exist between the national curriculum, the school and the class based curriculum, and the interaction of each kind of the curriculum with teachers' perceptions and professional training.

4.2) Current Curriculum Practice in Cyprus and the new model of change

Meyers and Grossen (1974, p. 217) argue that one purpose for research is to communicate its results and their implications to the community. However, Shipman (1985) points out that research findings do not easily reach politicians, inspectors, advisers and teachers directly and there are many obstacles for any research into curriculum policy to influence policy making. This is particularly true for this research since its suggestions have to do with changes in teachers' culture. It is very unlikely that teachers will be ready to accept the new model of curriculum

change since it implies a reconceptualisation of their role and suggests that they take on further job responsibilities, which they are reluctant to do, as is illustrated by their comments about developing a school policy (Chapter 6).

Similarly, policy-makers may not easily accept suggestions for treating the process of creating curriculum policy as an attempt to base it on issues acceptable by teachers since this raises questions about policy makers' expertise. Finally, the lack of any educational debate and the socio-political context of the educational system in Cyprus render "good practice" as not conceptually and empirically problematic for those involved. Thus, teachers and policy-makers can not easily see the failure of the current model of change and this is reflected to their comments about current curriculum policy in Cyprus (Chapter 6, Appendix A). Thus, the gap between the suggestions of this model and curriculum practice is provided below by indicating whether the interactions, mentioned by this model, can be identified in Cyprus.

Analysis of curriculum policy in Cyprus provided in the second and third chapters revealed that although inspectors took into account findings of research into Mathematics Pedagogy (DES 1982) and educational theory (Piaget 1952, 1956; Piaget et al 1960) in order to design the New Curriculum, they did not take into account teachers' perceptions of pedagogy. Cypriot teachers had to decide how to organise rather than create the New Curriculum and similar observations have been drawn from Morrison's (1987,

p. 38) study on the development of English policy (see also Chapter 3). It can be claimed that there is a hidden agenda of hierarchical and bureaucratic decision-making in the process of curriculum change in Cyprus.

In addition, evidence on the courses offered at ITT and INSET level revealed that these courses did not cover issues of the current curriculum reform and that there was no school based INSET. As a consequence, tutors of INSET were not able to collect evidence about either teachers' perceptions of curriculum policy or the difficulties of putting into practice the New Curriculum. Thus, there was only one interaction at the national level and this had to do with the fact that educational theory was taken into account in the design of the national curriculum. There was no interaction between the national curriculum, teachers' perceptions and professional training and there was not much interaction between INSET and local curriculum.

This model suggests that the national curriculum should be flexible in order to take into account the different interest groups of teachers. However, the New Curriculum and other policy documents were designed according to the needs of some of these interest groups (Chapter 5) and hence sometimes they were in conflict with the needs of other groups. This implies that there was an attempt to avoid any kind of differentiation among the various class based curriculum. Thus, the process of designing and diffusion of curriculum change does not promote the idea that in addition to the national there is a need for local curricula.

Finally, this model suggests that parents and pupils have to play a significant role in the process of curriculum change. It has been however shown that parents and pupils did not influence curriculum practice and that Cypriot teachers rarely considered either pupils or parents as able to play any role in the process of curriculum change.

4.3) The Network model as a short-term strategy

Although suggestions derived from this research could be limited to a long-term strategy of curriculum reform, a short-term strategy has been also identified. This strategy could be seen as an attempt to establish interactions among some of the factors of the new model which do not exist now. This strategy is also based on Adams and Cohen's (1981) suggestion that in the process of change it is convenient to start with the smallest element first. This strategy is, therefore, based on the assumption that we should regard each individual teacher as a discrete unit upon which change of beliefs should take place. We should also involve individual teachers in the business of reform and encourage them to share ideas in order to develop a collaborative culture among those teachers.

This could be done through establishing a professional association for primary education where teachers, on a volunteer basis, could share their experiences about the implementation of the curriculum policy and develop their own goals and strategies. Salter and Tapper (1981, p. 81) argue that "It is hard to predict the consequence of

educational change unless teachers share a common understanding of what is taking place". It follows that the main effort of this strategy should be concentrated not on how to persuade teachers to use materials which have been produced by a central team but on how to persuade them to share experiences. If teachers share experiences they will be able to define their own needs. This strategy is also designed to take into account the different interest groups of teachers. It can be argued that this strategy may be a first step towards developing collaborative culture among teachers.

Moreover, this association may contribute to the educational debate. This might be done through a circulation of the ideas which will be generated to the government and to the teachers' trade union. Thus, the assumption that inspectors are responsible for producing curriculum policy and teachers for implementing this policy may be questioned.

Obviously, this suggestion is mainly based on using the network model in Cyprus and can be criticised as a broadly unsystematic approach for curriculum change (Boyd 1984, p. 108) with too much reliance on the voluntary participation of teachers. It can be also argued that this strategy assumes that the teacher-members of the association will influence their colleagues' perceptions. However, this is an assumption which needs to be tested empirically. Nevertheless, this is only a short-term strategy which attempts to contribute to the consideration of curriculum change as it is suggested above. It is an attempt to

generate opportunities for reflective professionalism which can form a plausible vision. But this attempt depends on those few teachers who despite the system will try to change the structure of the system and contribute to the change of teachers' culture.

5 RESEARCH LIMITATIONS: SUGGESTIONS FOR FURTHER RESEARCH

This research set out to explore Cypriot teachers' perceptions of current curriculum reform, with reference to Primary Mathematics, to identify sources influencing their perceptions and draw implications for attempts to change the Mathematics curriculum in Cyprus. It is hoped that suggestions emerging from this study for both teachers and policy-makers (Section 4) will have an effect on the process of change. It is however important to illustrate the limitations of the research, and thus the restrictions on the implications of this research for the development of policy.

5.1 Findings from Comparing Questionnaire and Interview Data and the effect of the state upon perceptions

The validity of this study has been mainly seen as related to my attempt to compare the questionnaire and interview data gathered from it (Chapter 4). The advantages of using two methods of data collection can be seen in terms of the fact that exclusive reliance on one method may bias or distort the researcher's picture of the particular slice of reality he/she is investigating. Best and Kahn (1986, p.148)

point out that "some investigations could be strengthened by supplementing one approach with the other". It has been, however, mentioned that it is possible to collect invalid data by both methods since the question of whether the informant is telling the truth by filling questionnaire or giving interviews can not be answered.

Although Cohen and Manion (1989, p.270) argue that "the use of contrasting methods considerably reduces the chances that any consistent findings are attributable to similarities of method", the strong effect of the state upon perceptions and especially the consideration of "good practice" as not conceptually and empirically problematic by policy documents may be the reason for agreement between teachers' responses to both methods. The fact that the questionnaire and interview data support each other may be due to the fact that teachers reacted to both cases as they thought that they were expected to do. Several techniques were used to give teachers the impression that I was interested in how they saw teaching rather than how they thought educationalists and inspectors saw it (pp 158-161) but it is difficult to claim with certainty that they were persuaded.

It is also possible that some of the teachers agreed with the general statements of teaching and assessment in Mathematics provided by the questionnaire items without realising what the implications of these statements to their everyday practice are. Although Entwistle and Nisbet (1972, p. 406) suggest that evidence about teachers' opinions and attitudes can be collected through using the interview and

the questionnaire method since teachers have technical knowledge and are well able to understand the subtleties of the written word, the effect of the inadequacy of current educational language in its attempt to deal with the complexities of curriculum practice upon both methods should be taken into account. This mainly affects the questionnaire method but even the semi-structured interview is affected by inadequate language for curriculum discourse.

Finally, limitations on the validity of this research can be seen in terms of the difficulties in comparing the questionnaire with the interview data. It was first of all not possible to obtain precise estimates of the strength of their agreement with several methods of teaching and assessment by the interview method. Thus, I attempted to code each teacher's responses to the interview in terms of the questionnaire items and see whether they matched with his/her own responses to the questionnaire. It can not be claimed that this can be done objectively. Second, although the schedule of the interview provided a framework for comparison, the framework itself was no guarantee of objectivity. This was particularly true since I could not expect each teacher to raise opinions related to all the questionnaire items. Thus, teachers' comments did not always raise all the issues which were included in the questionnaire and comparison was possible for only some of the teachers' responses to some of the questionnaire items. Finally, for those few cases where the questionnaire and interview data did not match, it was not easy to be certain whether this was due to methodological problems since some

other explanations for this mismatch were also found (see Chapter 6). It can not be therefore claimed that the match derived from most of the questionnaire and interview data gathered by this study necessarily implies that its validity is high.

5.2 Promoting the Utilization of Research Results

Apart from the ethical issues related to the methods used for collecting data about teachers' perceptions mentioned above (p. 164), Kidder et al (1981, p. 403) argue that investigators must give participants information about the results of their studies. The need for disseminating to both teachers and inspectors the findings of this research is particularly important for the following four reasons. First, this research has been based on the assumption that teachers' perceptions are essential for the effectiveness of any curriculum change (Chapter 3). Second, Cane and Schroeder (1970) revealed that English teachers believed that research findings ought to be disseminated and it is very likely that Cypriot teachers have the same perceptions. This assumption can be based on the fact that Cypriot teachers were enthusiastic about participating in this research and this was attributed to the lack of any research in Cyprus. They are, therefore, likely to be enthusiastic about research publication that refers to an improvement in their occupational culture. Third, a dissemination of these results may contribute to attempts to change teachers' culture since either co-operation among teachers and researchers (Broadfoot 1980) or even a change of teacher's

role to that implied in "research based teaching" (Stenhouse 1975) may be achieved. This is of paramount importance for attempts to change teachers' role and professionalism which are directly linked to attempts to change the curriculum in Cyprus. Finally, dissemination of the findings of this research may contribute to the establishment of the professional association on primary education (p. 368) and therefore to educational debate which can raise questions about teachers' role in the process of change (p. 121).

The effectiveness of my attempt to disseminate my results to teachers depends partly on their perceptions about the role of research and on the time they have available for reading reports. This should be also seen in terms of the fact that Cypriot teachers have little opportunity to read such reports. On the other hand, affecting policy through a dissemination of the research findings to policy makers is an even less easy task. In practice, policy making is neither rational nor linear (Weiss 1980, Bulmer 1982b) and it is difficult to claim that all research is welcomed by politicians and inspectors. As a consequence, concentration on the special methodological problems of research linked with policy making (Shipman 1985) is required, and on the ways in which its findings should reach politicians, inspectors, and teachers directly.

Thus, the possibility that the results may be misinterpreted either intentionally or unintentionally and hence used to support a particular policy has been taken into account and a short report dealing with the implications of this

research for issues of curriculum policy in Mathematics, teachers' professionalism and the management of curriculum change was sent to both teachers and inspectors. In addition, the issue of unequal access to research implications by teachers and inspectors was seen in terms of the kind of report which I could send them. This report did not include a thorough analysis of the findings and especially complex statistical terms since teachers are unfamiliar with them. I attempted to present my findings in such a way that teachers could not easily complain that it was too long, phrased insensitively or biased in presentation.

It can be claimed that although some limitation of this research has been identified (Chapter 4 and 7) its attempt to contribute not only to the educational theory but also to communicate with teachers and policy-makers by sharing with them its view on what is going on in the primary schools (Eisner 1986) should be seen as its strengths.

5.3) Further Research

Suggestions about further research were also derived from this study and follow Rohwer's (1973) suggestion that research should be developmental in order to be applied systematically. Application of the findings of this research can be therefore seen in terms of the following five research areas. First, its suggestion for the establishment of a professional association on primary education should be evaluated in terms of teachers' perceptions. Such evaluation

can be first of all seen in terms of teachers' willingness to participate in this association. It can be then done by identifying its effect upon perceptions of teacher-members of this association. Finally, an evaluation of this association should be done in terms of its contribution to educational debate and to attempts to change teachers' culture by looking for instance on any increase of the number of teacher-members of this association

A second research area which needs further exploration is whether and how home-school-state collaboration can be developed. This can not be done by research examining teachers' perceptions only. Data about parents' and inspectors' perceptions should be also gathered which may help us to identify the various sub-groups of these two groups and whether any of these sub-groups may act as a source of developing such collaborative culture. Action research in pilot programmes should also be evaluated.

Third, attempts at changing the structure of the educational system , either due to suggestions provided by this study or irrespective of this study, should be evaluated in terms of their effects upon teachers' perceptions. For instance, reform on teachers' inservice education should be seen in terms of the effect of professional training upon perceptions of curriculum reform and particularly whether this reform has helped them not to be passive delivers of other people's curriculum (MacDonald and Walker 1976, p.27). In addition, Cornwall's (1981) suggestion that the development of confidence to assess their pupils is very

important seems to have a further implications for an evaluation of a reform on teachers education. Moreover, Ainscow (1988, p. 152) argues that the key to effective assessment lies in teacher confidence as well as the adoption of new techniques. This reveals that teachers' confidence and skills should be also taken into account by any evaluation of reform on teachers' inservice education.

The last two areas of research are linked to the limitations of this study. The fourth one is concerned with the effect of the conceptions of "good practice" as not problematic, upon teachers' perceptions. Such research might explore methodological issues related to the validity of this study (p. 373), and provide further evidence on the value of a flexible policy on pedagogy and curriculum content (p. 347).

Finally, further research is needed to explore the national picture in England. Such research will not have implications only for English curriculum reform in Mathematics but also for attempts to use a comparative dimension which can contribute to understanding the impact of central control and the culture on curriculum change (Keeves 1986 pp 24-25). Research evidence on the impact of the culture are mainly related to developing countries, (Nairn 1985, Mooris 1988, Sinclair and Lillis 1980, Saunders 1982). However, the above studies did not take into account the impact of central control. Therefore, Wojciechowska's (1988 p.158) suggestion for "further investigation on curriculum reform, especially by Mathematics educators in countries with centralised education systems" reveals the need for further comparative

research related to the management of curriculum change in Mathematics.

In conclusion this research may provide teachers, heads, inspectors, and researchers with suggestions on how they could work, individually and together, for a reconceptualisation of the process of curriculum change in Cyprus. Change is not an easy task since it is a matter of changing culture but there are only two ways to respond to the challenge of change. One is to adopt the requirements of the system passively and the other is to attempt to take charge, despite the dominant perceptions about how the "system" should operate. Thus, the use to which this research is put will depend on those individuals who will be persuaded that they should choose the latter rather than the former mode and attempt to become collaborative change agents.

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Appendix A: Findings from interviews with Cypriot inspectors

The analysis of curriculum policy in Cyprus provided in the review of the literature based on curriculum documents, is a search of primary sources since there are no discussion or consultative documents exploring the issues of teaching and assessment raised by these documents. In addition, there is no secondary source for curriculum and assessment policy which could be used to analyse the policy documents. Thus, the purpose of interviews with Cypriot inspectors who are responsible for the formation of policy, was to enable comparison between findings from these interviews and findings from the analysis of the curriculum documents. This can be seen as an attempt to explore the validity of the analysis of Cypriot policy documents.

The analysis of the findings from interviews with 10 Cypriot inspectors (38.5% of the whole group of inspectors) was based on the structure of the interview schedule (Appendix C) which had mainly been constructed around the topics of the policy initiatives presented in Chapter 3. Thus, the presentation of the analysis of the data from interviews with inspectors is divided into the following 4 parts, concentrating on their perceptions about:

a) Purposes of teaching Mathematics and nature of Mathematics
b) Mathematics pedagogy
c) Purposes and methods of assessment
d) Curriculum change

a) Purposes of teaching Mathematics and the nature of Mathematics

In response to my first question about the purposes of teaching Mathematics, all of them considered the development

of children's mathematical thinking as the general aim of teaching Mathematics. However, one of them claimed that:

> "Although there is a balance among the purposes of Mathematics which are promoted by the new curriculum, the purpose concerned with the development of Mathematical thinking has not influenced curriculum practice. This is due to the fact that neither teachers nor inspectors attempted to find out what mathematical thinking means". (Inspector 2)

In supporting his argument, it is important to mention that inspectors were not able to give a clear answer in response to my follow-up question concerning the meaning of the mathematical thinking. Nevertheless, all of them made clear that pupils should be able to solve day-to-day problems and gain basic mathematical knowledge.

The development of positive attitudes was also seen by most of them (7 out of 10) as an important purpose of teaching mathematics. However two of them saw that purpose as related to the fact that mathematics is useful to solve day-to-day problems, whereas others emphasised that if teachers achieve this purpose, pupils will not be afraid of mathematics and hence a main obstacle for learning mathematics will be avoided. Finally, the purpose concerned with children's ability to talk about mathematics was raised when I asked a more specific question about the role of talk in teaching Mathematics. This reveals some doubts about inspectors' commitment to this purpose and especially due to the fact that most of them mentioned mathematical language only. Seven out of ten mentioned only the provision of children

with mathematical terms and their correct use. The only one who emphasised this purpose revealed that:

> "I believe that the basic purpose of teaching mathematics is to make children familiar with the mathematical environment. They should realise that there are many situations in their lives which have to do with mathematics. Thus, they should be able to identify them and communicate through them(Inspector 9)

Although there was a substantial agreement among inspectors about purposes of teaching mathematics, there was not such consensus about the nature of mathematics. This can be easily linked to the lack of any clear policy on that aspect. Thus, three inspectors supported the utilitarian nature of Mathematics. This was not seen only in terms of developing useful skills for their life, but also in terms of the fact that they will use the knowledge which they will gain, in order to achieve further educational goals when they will become pupils of the secondary school. However, one of them argued that Mathematics should not be seen only in terms of that aspect of its nature.

> "We cannot support the idea that unless a subject is useful for children's life it will not be taught. In that case we should not teach literature or we should not do physical education, but garden-work. Similarly, we can not claim that some mathematical areas which may not be directly related to day-to-day problems should not be taught." (Inspector 4)

Two other inspectors emphasised the hierarchical structure of mathematics and argued that children should appreciate this aspect of mathematics. On the other hand, two other inspectors emphasised the harmony of mathematics and suggested that children should see how this harmony of

mathematics is related to what takes place in their environment. Finally, two inspectors emphasised that teaching Mathematics helps children to become useful citizens of Cyprus, and able to contribute in the improvement of their society.

b) Mathematics Pedagogy

The principal issue which derived from their interviews is the strong consensus among them about the "active pedagogy". Although almost all of them (8 out of 10) mentioned that there is not any single teaching method which can be considered as the "good" one, they considered practical and investigative tasks as the most effective way of teaching Mathematics. Furthermore, six of them mentioned that children should see the reason for doing a practical activity. They should try to solve a problem which they really want to solve and not to do it only because their teachers asked them to do it. These opinions about teaching reflect a "progressive" ideology. However, almost none of them attempted to justify his strong belief about the importance of doing practical and investigative tasks. They took it for granted that such tasks contribute to children's learning.

Similarly, none of them attempted to justify any other issue of mathematics pedagogy, raised in their interviews, by taking into account the general purpose of primary education in Cyprus. There was only one who attempted to justify the need for developing children's ability to use various

strategies to solve problems (Nelson and Warth 1983, Dolan and Willianson 1983, Pantelides 1991b). He argued that:

> "The fact that these problems cannot be solved by using only one method, implies that we should not say that this is the solution of the problem and this is a wrong answer. It also implies that children should present their ways of working to solve it and attempt to support their solution. I could say that these problems make children able to talk with others and prepare them to live in a democratic environment where each citizen is able to support his opinion. It is also important that this dialogue about Mathematics has nothing to do with feelings but with Mathematical logic.(Inspector 4)

Their comments about curriculum organisation revealed that all of them suggested the need for keeping a balance among group work, individual work, and work with the whole class. However, they did not have a coherent view about either individual or group work. As far as the individual work is concerned, three of them saw it as related to teachers' attempt to help the low attainers to understand a concept, while other pupils are trying to do a written task. They did not mention anything about high attaining pupils. On the other hand, five of them did not have a clear opinion about individual work but they acknowledged that: "It is difficult to organise a class of 30 pupils in such a way that each pupil is working on his/her own task" (Inspector 1). Finally, only two of them had strong perceptions about the importance of individual work for pupils, irrespective of their abilities.

Although all of them expressed their agreement with the importance of group work, they did not have a coherent view on how to make groups. Four of them suggested that teachers

should make mixed ability groups and were against streaming. On the other hand, two others suggested the establishment of groups according to pupils' ability and they saw that as related to attempts to help pupils individually. The following comments provide an illustration of perceptions held by these two:

> "When I have to introduce a new concept, I have to teach it to the whole class. I will then give tasks to three or four different groups created on the basis of their abilities. Each group works on its task. One group may reach up to the 5th level of difficulty and another up to the 10th level. At the same time I go around the class and help pupils of each group individually. This is also a way to organise your class so that pupils are working according to their abilities. Individual work does not necessarily mean offering different tasks for each pupil." (Inspector 6)

All of them supported the need for direct experience of using Mathematics in a wide range of contexts throughout the curriculum. This implies that they supported one of the three kinds of cross-curricular approach. They were however against topic work. All of them argued that there is a need for having a subject specific curriculum and a timetable where the time at which each subject should be taught is defined. The following quotation illustrates this perception

> "I do not agree that we can teach a new Mathematical concept while we are teaching History, or Geography or Art. We should only help them to see the application of mathematics in order to understand, for instance, the data of a relevant table. I do not agree that teachers should not teach each subject separately and I do not think that teachers are ready to teach topics only" (Inspector 5)

c) Assessment in Mathematics

An essential element of inspectors' perceptions about assessment is their consideration of written tests as the

most appropriate techniques of assessment. Their comments revealed that they considered written tests as the "formal" technique of assessment. In addition, the comments of six of them gave the impression that they saw written tests as the only valid techniques of assessment. The next comments are representative of inspector's perceptions about written tests:

> "I believe that assessment in mathematics means that you use a written test, which includes exercises related not only to the topic which you are teaching at that particular time, but also to topics that have been taught previously ... The second criterion of a good assessment is to make sure that the exercises included in your tests are designed to assess pupils' knowledge in that area which you are interested on ... It should be finally mentioned that we have to use written tests in order to get valid results, since this is the only method that produced such results." (Inspector 3)

However, most of the inspectors responded to my more specific question concerned with whether other than written methods of assessment can be used, by indicating that oral techniques may be also used for assessment in Mathematics. Nevertheless, they were not able to explain how oral techniques can be used for assessing pupils' mathematical skills and attitudes. And although they agreed that attitudes to mathematics should be assessed, they were not able to provide any suggestion on how teachers should do it. There was only one inspector who suggested that teachers should use interviews. He pointed out that they may try to do it not only while they are teaching, but also during face to face meetings with pupils taking place during the break.

As far as their perceptions about purposes of assessment is concerned, all of them considered formative purposes of assessment and teacher's self-evaluation as the most important purposes of assessment. However, they could not easily see the importance of developing a policy on purposes of assessment. In supporting this argument, it is important to mention that five of them revealed that they had never thought consciously about what the purposes of assessment should be.

Moreover, a controversial issue seems to be that of summative purposes of assessment. Although almost all of them did not agree with that purpose, their disagreement had nothing to do with the practical difficulties of developing a single assessment system which could be used to help teachers to achieve both formative and summative purposes. Their disagreement with summative purposes had mainly to do with their fears of labelling children as "backwards" and its effect upon their attitudes to Mathematics, especially due to the fact that mathphobia can be identified among many pupils. Finally, the following comments are typical of those raised by three of them and revealed doubts that they really disagreed with summative purposes of assessment:

> "I do not agree that teachers should compare the pupils of their class to find out who is the best. However, a head may use information gathered from assessment to compare pupils' abilities in two classes of the same year group in order to find out the most effective teacher. This cannot be done unless we distribute pupils of the same school so that classes of the same year group have in general pupils with the same ability. It can be finally claimed that a head who tries to do that, gives the message to his teachers that they have to help their pupils to improve their skills at the maximum level." (inspector 7)

In respect of other purposes of assessment, there was agreement that teachers assessment should provide information to government in order to help them to define the national standards in Mathematics. They were not however able to say neither how they should use these information to identify the "standards" of Cypriot primary pupils, nor which could be the implications of this attempt for the process of developing curriculum policy in Mathematics.

The main issue related to inspectors' perceptions about methods of assessment is the fact that they considered assessment as natural part of teaching. It is, however, clear that they had never tried to identify implications of this consideration for how assessment should be conducted. Their consideration of assessment as natural part of teaching was simply related to the requirements of the objectives model which they strongly supported. They could not see that this consideration implied that teachers might assess pupils' abilities while they are teaching or that pupils may learn while their teachers try to assess them. As a consequence, they had doubts on whether pupils' ability to apply mathematics in unfamiliar situations should be assessed and two of them said that these tasks could be part of teachers' attempt to teach mathematics rather than assess.

The last issue about assessment which emerged from these interviews, was the lack of any opinion on whether pupils were able to assess themselves in mathematics. There was

only one inspector who strongly supported this method of assessment. He pointed out that:

> "Assessment should not be only done by teachers but also by pupils. This is particularly important when I want to find out about the national standards or when I want to use the information gathered from it in order to evaluate the curriculum" (Inspector 8)

d) Management of curriculum change

Four issues related to the process of change were raised by inspectors. First of all, almost most of them supported that societal changes should be taken into account when they have to design the curriculum policy. However, three of them criticised the content of the current curriculum reform, by indicating that technological changes had not been taken into account:

> "The curriculum should aim to make pupils able to live in the society of the 21st century. However, the New Curriculum deals only with the current problems of our society and not with those which we will face in 20 years. In addition, we have not taken any decisions on the use of computers in primary schools whereas some of our pupils have started to use them at home." (Inspector 10)

Second, there was a strong consensus about the important role of professional training for bringing about curriculum change. All of them pointed out that student teachers should be taught Mathematics at the University in a similar way to that they are expected to teach at school, since their ideas about teaching are influenced by the experiences they have from being taught at school and University. They also argued that teachers should have the opportunity to attend INSET courses related to the current curriculum reform. Moreover,

one of them believed that there was a need for developing a policy on induction. He argued that:

> "The first two years of your teaching experience are very important. If you meet teachers who are keen on teaching and try to implement new methods, you will also try to do the same. For this reason, we should develop a policy on induction and decide how we will offer them an appropriate environment for their professional development" (inspector 2)

The third issue, which was raised by only two inspectors, has to do with job satisfaction. They suggested that since teachers are those who are going to implement the current curriculum reform, the centre should create motives for them to implement it. His argument is partly related to the importance of developing a link between professional development and the process of curriculum change. It could be argued that the last two issues are in line with suggestions for changing teachers' occupational culture in order to change curriculum practice. However, inspectors could not see this need. Although one inspector mentioned that there was a need for moving towards a less centralised system, neither he nor anybody else expressed any opposition in principle to the current process of curriculum change. All of them pointed out that inspectors should explain to teachers how and what to teach, in order to make them more effective. This implies that they considered themselves as the "experts". It can be therefore claimed that they do not challenge the centralised system but are a force for conservatism.

APPENDIX B: QUESTIONNAIRE TO TEACHERS

I am conducting research into teachers' perceptions of the national curriculum and assessment in Mathematics. I would be grateful if you could take twenty minutes or so to complete this questionnaire, anonymously.

PART A: In this part put a tick in the appropriate box

1. SEX: Male ☐ Female ☐

2. Length of teaching experience (including this year as 1 full year)

   1 year ☐ 2-5 years ☐ 6-10 years ☐

   11-20 years ☐ More than 20 years ☐

3. Which of the following initial teacher training qualifications do you hold? (Tick as many as apply)

   Teacher's Certificate ☐ B.Ed./B.A.(Q.T.S.) ☐

   B.A. ☐ B.Sc. ☐ PGCE ☐ Other ☐

4. Did you take Mathematics as a main or subsidiary subject during your initial training?

   Yes ☐ No ☐

5* Which of the following post-experience qualifications do you hold? (Tick as many as apply)

   B.Ed. ☐ B.A. ☐ B.Sc. ☐ M.A. ☐
   M.Ed. ☐ Advanced Diploma ☐ Other ☐

6* Did any of your post-experience qualification had to do with Mathematics or Education?

   Yes ☐ No ☐

7. Have you followed any DES 20-Day Courses** or their equivalent in length concerned with teaching Mathematics?

   Yes ☐ No ☐

8. Do you hold any formal post of responsibility for Mathematics in your school?

   Yes ☐ No ☐

9. Size of your class:

   Under 20 ☐ 21-23 ☐ 24-26 ☐ 27-29 ☐

   30-32 ☐ 33-35 ☐ More than 36 ☐

10. Which of the following year groups are in your class? (Tick as many boxes as apply)

    Reception ☐ Year 1 ☐ Year 2 ☐ Year 3 ☐

    Year 4 ☐ Year 5 ☐ Year 6 ☐ Other ☐

11. How confident would you say you are about teaching Mathematics in primary school?

Not at all confident	☐	Confident in a limited way	☐
Quite confident	☐	Very confident	☐
Don't know/can't say	☐		

12. How confident would you say you are about assessing children's attainment in Mathematics in primary school?

Not at all confident	☐	Confident in a limited way	☐
Quite confident	☐	Very confident	☐
Don't know/can't say	☐		

PART B

The following two questions (11 and 12) indicate four purposes of teaching and assessing Mathematics respectively. Please **rank** the importance you attach to the four purposes using the numbers 1 to 4 for each question. Give **1** to the purpose you regard as **the most important**, **2** to **the next most important** and so on, with **4** meaning **the least important.**

13. Children should learn Mathematics in order to:

a) be able to talk about Mathematics and to discuss their performance ☐

b) gain knowledge of basic concepts and facts in Maths ☐

c) develop positive attitudes to Mathematics ☐

d) engage in practical investigations and problem-solving ☐

14. The main purpose of assessment in Mathematics should be to:

a) provide information to enable teachers or parents to make comparisons across classes and pupils ☐

b) contribute to teachers' self-evaluation ☐

c) help identify and diagnose pupils' learning needs ☐

d) provide information to the government on how well the educational system is operating ☐

PART C

Please rate each of the following items (Nos.13-29) by circling the appropriate number. The numbers represent the following values:

1 = Absolutely disagree;
2 = Disagree;
3 = Don't know/can't say;
4 = Agree;
5 = Absolutely agree.

15.	There is a fixed sequence of Mathematical topics which it is necessary for children to follow	1	2	3	4	5
16.	Assessment should form a natural part of teaching activities	1	2	3	4	5
17.	The methods of teaching as well as the methods of assessment should be subject to whole school decision-making	1	2	3	4	5
18.	Practical activities in Mathematics are as appropriate for Key Stage 2 pupils as for Key Stage 1 pupils	1	2	3	4	5
19.	Practical activities in Mathematics are as appropriate for high attaining pupils as for low attainers	1	2	3	4	5
20.	Much of the value of an activity or an investigation can be lost unless pupils can talk about their results	1	2	3	4	5
21.	It is necessary for children to do Mathematics at a fixed time every day	1	2	3	4	5
22.	Children must have direct experience of using Mathematics in a wide range of contexts across the curriculum	1	2	3	4	5
23.	Teachers should assess on the basis of pupils' learning products rather than the learning process	1	2	3	4	5
24.	Assessment should include the assessment of pupils' attitudes to Mathematics	1	2	3	4	5
25.	Mathematics should be taught mainly through practical investigations	1	2	3	4	5
26.	Teachers should assess the child's ability to apply Mathematics in unfamiliar situations	1	2	3	4	5
27.	Having the National Curriculum in Mathematics is:					
	a) useful for planning my teaching	1	2	3	4	5
	b) useful for carrying out my teaching	1	2	3	4	5
	c) useful for assessing children's learning	1	2	3	4	5

		Absolutely disagree	Disagree	Don't know/can't say	Agree	Absolutely agree
28.	In making decisions about a national curriculum the government should take into account teachers' perceptions	1	2	3	4	5
29.	INSET in Mathematics should mainly deal with problems which I have to face in my classroom	1	2	3	4	5
30.	What I have been expected to teach in Mathematics in my class in this year is manageable	1	2	3	4	5

PART D : Mathematics in your own classroom

31. In general, please estimate the proportions (out of 100% if possible) of time in Mathematics lessons, that the children in your class spent on the following:

a) Working on individual tasks ____%

b) Working on collaborative group tasks ____%

c) Working as a whole class ____%

32. Which of the following do you use most frequently for planning your mathematics teaching? (Tick one box)

National Curriculum ☐ My School's Scheme(s) ☐

Non-Statutory Guidance ☐ Other ☐

33. Rate each of the following factors which might influence your classroom practice in Mathematics by circling the appropriate number. The numbers represent the following values:

1 = No influence at all;
2 = Only a little influence;
3 = A definite influence;
4 = A strong influence;
5 = A very strong influence.

a)	Views of my colleagues	1	2	3	4	5
b)	Head's views	1	2	3	4	5
c)	Parents' views	1	2	3	4	5
d)	Pupils' views	1	2	3	4	5
e)	Advisers' views	1	2	3	4	5
f)	National Curriculum & Non-Statutory Guidance	1	2	3	4	5

34. Ideally, to what extent would you wish the following to influence your classroom practice? Please use the same rating as in the previous Question (No.32).

	No influence at all	Only a little influence	A definite influence	A strong influence	A very strong influence
a) Views of my colleagues	1	2	3	4	5
b) Head's views	1	2	3	4	5
c) Parents' views	1	2	3	4	5
d) Pupils' views	1	2	3	4	5
e) Advisers' views	1	2	3	4	5
f) National Curriculum & Non-Statutory Guidance	1	2	3	4	5

35. Below are 8 **techniques of assessment.** Rank these techniques twice (column A and column B). In **column A** give **1** to the **most appropriateor** Mathematics, **2** to the **next most appropriate** and so on with **8** meaning the **least appropriate.** In **column B** give **1** to the technique which you consider the **easiest** to use, **2** to the **next easiest** and so on with **8** meaning the **least easy.**

	Column A Appropriateness	Column B Ease
a) Multiple choice and matching questions	☐	☐
b) Unstructured observation of children's work	☐	☐
c) Sentence completion	☐	☐
d) Oral question-and-answer	☐	☐
e) Extended written questions	☐	☐
f) Structured observation of children's work	☐	☐
g) Interviewing individual children	☐	☐
h) Setting direct written questions	☐	☐

36. Below are 6 ways of **improving assessment** in Mathematics. Please rank these to reflect your opinion. Give **1** to the **most important**, **2** to the **next most important** and so on with **6** meaning the **least important.**

a) In-service training related to practical problems of teaching and assessment ☐

b) Time free of class contact ☐

c) Smaller class size than now ☐

d) Other adult in the classroom while assessment is occurring ☐

e) More curriculum time in Mathematics ☐

f) Special guidelines from a staff meeting or mathematics co-ordinator ☐

37. Do you think that pupils in your own classroom have understood enough Mathematics to assess most of their own work in Mathematics? (Tick one box)

Yes ☐ No ☐ Don't know/can't say ☐

38. Please feel free to write below any other comment about teaching and assessment of Mathematics.

Thank you very much for your help.

Leonidas Kyriakides
Post Graduate Student
University of Warwick

** This item was included in the questionnaire to Cypriot teachers only*
***The questionnaire to Cypriot teachers asked them to indicate whether they attended the courses of "Epimorfoses"*

APPENDIX C1

STRUCTURE OF THE INTERVIEW SCHEDULE

Interview with: _____

-o0o-

A) Questions 1 up to 4 were discussed with all of them (beginning teachers, teachers of five schools and inspectors)

Question 1: **What, in your opinion, are the purposes of teaching Mathematics in Primary School?**

Comments

a) Gain basic knowledge

b) Skills: 1. Talk about Mathematics

2. Mathematical Language (terms)

c) 3. Able to engage in practical investigations and problem solving

d) Develop positive attitudes to mathematics

Is there anything else ?

Question 2: **What, in your opinion, are the purposes of assessment in Primary schools?**

Comments

1 Diagnostic-Formative

2 Summative - to enable them make comparisons among:

a) Pupils
b) Classes
c) Schools

3 Government (monitor or inform on how well the educational system is operating)

4 Teacher's Self-evaluation

5 Teacher's Appraisal

Follow-up Questions

May I ask you who needs the result of assessment ?

OR

What is your opinion about ......?

And finally

Is there anything else ?

Question 3: What, in your opinion, are the characteristics of "good practice" in teaching of Mathematics in Primary School?

Comments

a) Practical Activities:
   1) Low Attainment only *
   2) Difference across age *

b) Opportunities to talk **

c) Investigation Tasks **

d) Direct experience of Maths in a wide range of contexts through the curriculum *

e) Fixed sequence of topics *

f) Flexibility of:

   1) Choosing teaching time **

   2) Length of time *

g) Balance between:

   1) Individual v. Group *

   2) Oral v. Written **

Follow-up Questions

What are your feelings regarding the following 3 aspects of teaching Mathematics?

1) Teacher's Role
2) Pupil's Role
3) Curriculum-organization (Emphasis on how he/she organise his/her classroom)

Finally:

Is there anything else ?

* I need to have relevant opinion
** Only if he/she mentions it

Question 4: How, in your opinion, should teachers assess their children's ability in Maths in Primary School?

Comments

a) Natural part **

b) Process rather product *

c) Assess attitudes to Maths *

d) Assess child's ability to apply Maths in unfamiliar situation *

e) Ways of using results:

1) Parents **
2) Child **
3) Confidentiality **

f) Techniques of assessment:

1) Oral-Interview *
2) Written *
3) Observation *

g) Record keeping:

1) What form should it take or how should teachers do it? **

2) How important is it? **

3) How frequently should they do it? **

Follow-up Questions:

What is your opinion about (* items not mentioned)?

Have you got any other comment about assessment in Maths in Primary school ?

* I need to have relevant opinion

** Only if he/she mentions it

B.1) Questions 5-10 were discussed with teachers of five schools

Question 5: **Do you think that your school has any policy on teaching and assessment in mathematics and how it can be identified?**

Comments

a) Documents with suggestions about *

1) Purposes of Mathematics

2) Methods of teaching

3) Methods of Assessment

b) Any document concerned with special problems of your school *

c) Decisions taken on staff meeting concerned with *

1) Co-operation among teachers **

2) School- based INSET **

3) Visiting each other's class and exchanging ideas **

d) Co-ordinators in Mathematics *

Follow-up Question

What about (* items not mentioned) ?

Is there anything else which reveals that there is a policy in teaching and assessment in your school?

Question 6: **Do you think that each school should develop a school policy and why?**

* I need to have relevant opinion

** Only if he/she mentions it

Question 7: **Who has influenced your classroom practice in teaching and assessment in Mathematics during this year?**

Comments

a) Colleagues *

b) Your Headteacher *

c) Co-ordinator in Mathematics *

d) Inspector *

e) Your pupils *

f) Parents *

g) Policy documents* (New Curriculum, Triminiaia (Non statutory guidance)

Follow-up Question

What about (* items not mentioned) ?

Is there anything else ?

Question 8: **Is there anybody who have influenced your work whom you do not want to be able to do so? and Is there anybody who have not influenced your work but you want him/her to be able to do it?**

a) Colleagues *

b) Your Headteacher *

c) Co-ordinator in Mathematics *

d) Inspector *

e) Your pupils *

f) Parents *

g) Policy documents* (New Curriculum, Triminiaia (Non statutory guidance)

* I need to have relevant opinion

Question 9: Having in your mind all the schools where you had been worked, can you tell me that one which you would like most and why?

Comments

a) Relations with Colleagues

b) Personality of headteacher

c) Pupils' abilities

d) Relations with parents

e) Other

Question 10: Is there any other comment relevant with teaching and assessment in Primary school or with your experience from teaching which you would like to mention?

B.2) Questions 5-8 were discussed with Inspectors only

Question 5: **Do you think that there is a difference between curriculum policy and curriculum practice? and if so why?**

Comments

a) Training (ITT and INSET)*

b) Textbooks/workcards*

c) Working conditions**

d) Mathematics Curriculum *

e) Teachers' Perceptions**

f) Requirements of Curriculum Policy*

Follow-up Question

What about (* item not mentioned)?

Is there anything else which is the reason for this gap between curriculum policy and practice?

Question 6: **What are the ways of improving teaching and assessment in Mathematics, in your opinion?**

Comments

a) Training *

b) Publishing guidelines/ new textbooks *

c) Better working conditions *

1) Smaller class

2) Adults in the classroom

d) More curriculum time *

e) Schools should have co-ordinators *

f) Developing a school policy **

Follow-up questions:

1) What about (* items not mentioned)?

2) What's your opinion on having a national assessment system, would it be able to help?

Question 7: **What do inspectors should do to help teachers to improve their curriculum practice in Mathematics?**

Comments

a) Role of Advisers rather than Inspectors *

b) Visit more often **

c) Contribute to School Based INSET **

d) Contribute to the development of a school policy **

e) Teaching together (Co-operation)**

* I need to have relevant opinion

** Only if he/she mentions it

Question 8: **Is there any other comment relevant with teaching and assessment in Primary school or with your role which you would like to mention?**

APPENDIX C2

TEXT OF THE LETTER SENT TO INTERVIEWEES IN ADVANCE

In the interview I would like to discuss the following topics. I am interested in how you see them, rather than how you think other people see them:

1. The Purposes of Teaching Mathematics in Primary Schools

2. The Purposes of Assessment in Primary Schools

3. Characteristics of "good practice" in Teaching of Mathematics in Primary School

4. Appropriate methods of assessment in Mathematics.

5* The factors which influence your classroom practice during this year and the way your school is organised.

5** The differences between curriculum policy and curriculum practice, how this difference can be diminished and what your role should be.

6. Ways of improving curriculum practice in Cyprus and kind of support that you would like to get in order to become better teacher?

Leonidas Kyriakides

* It was included in letters sended to teachers of the five schools.

** It was included in letters sended to Inspectors

APPENDIX D: FURTHER STATISTICAL TABLES AND FIGURES

Table D.1: Chi-square values, degrees of freedom and Kolmogorov-Smirnov values for which statistical significant differences between the following sub-groups of the 10% randomly selected sample of Cypriot teachers have been identified.

No.	Groups of 10% of Cypriot teachers compared	K-S Z	p	X^2	d.f.	p
1.	Male Year1 teachers Vs. Female Year1 Teachers	N.A.	N.A.	-21.66	1	.001
2.	Male Year2 teachers Vs. Female Year2 Teachers	N.A.	N.A.	-7.28	1	.007
3.	Male Year5 teachers Vs. Female Year5 teachers	N.A.	N.A.	16.37	1	.001
4	Male Year6 teachers Vs. Female Year6 teachers	N.A.	N.A.	23.06	1	.001
5	Male Cycle A* teachers Vs. Female Cycle A teachers	N.A.	N.A.	40.53	1	.001
6	Male Cycle B** teachers Vs. Female Cycle B teachers	N.A.	N.A.	40.53	1	.001
7	Year1 teachers grouped into their years of experience	2.21	.001	N.A.	N.A.	N.A.
8	Year6 teachers grouped into their years of experience	1.66	.008	N.A.	N.A.	N.A.
9	Cycle A teachers grouped into years of experience	1.67	.007	N.A.	N.A.	N.A.
10	Cycle B teachers grouped into years of experience	1.35	.050	N.A.	N.A.	N.A.

*: Teachers who teach pupils of year 1 or year 2 or year 3
**: Teachers who teach pupils of year 4 or year 5 or year6

Table D.2: Chi-square values and degrees of freedom for which statistical significant differences between the following sub-groups of the beginning Cypriot teachers and the sample of 10% of Cypriot teachers hve been identified.

No.	Sub-groups of beginning Cypriot teachers against sub-groups of the sample of 10% Cypriot teachers with the same characteristics	X^2	d.f.	p<
1.	Year1 teachers Vs. Year1 Teachers with one year experience	- 33.73	1	.001
2.	Year2 teachers Vs. Year2 Teachers with one year experience	- 4.29	1	.040
3.	Year5 teachers Vs. Year5 teachers with one year experience	5.76	1	.016
4	Year6 teachers Vs. Year6 teachers with one year experience	8.27	1	.004
5	Cycle A teachers Vs. Cycle A teachers with one year experience	-15.05	1	.001
6	Cycle B teachers Vs. Cycle B teachers with one year experience	15.05	1	.001

Table D.3: Frequencies, and percentages of Cypriot teachers who use the following documents for their planning

Used for planning	Frequencies	Percentage	Valid Percen.
New Curriculum	36	19.5	19.7
Triminiaia (Non-Statutory guidance)	40	21.6	21.8
Textbooks	104	56.2	56.8
Other	3	1.6	1.6
Did not respond	2	1.0	-
Total	185	100.0	100.0

Table D.4: Agglomeration schedule using Ward method for Cypriot teachers' responses to item 31 concerned with how they organise their Mathematics classroom

Stage	Clusters Comb/ed		Coeffic.	Stage Clust. 1st Appears		Next Stage
	Clust.1	Clust.2		Clust.1	Clust.2	
160	4	45	3140	127	147	166
161	35	119	3406	157	0	168
162	30	33	3728	133	119	176
163	9	25	4071	156	136	175
164	19	125	4418	141	131	173
165	1	8	4973	158	116	173
166	4	5	5603	160	149	180
167	2	18	6298	152	153	174
168	35	74	7010	161	135	172
169	16	80	8012	154	151	178
170	3	7	9179	159	155	174
171	13	69	10468	148	0	175
172	14	35	12059	150	168	176
173	1	19	13824	165	164	179
174	2	3	15685	167	170	178
175	9	13	18025	163	171	177
176	14	30	21193	172	162	177
177	9	14	28758	175	176	179
178	2	16	38904	174	169	180
179	1	9	54024	173	177	181
180	2	4	69608	178	166	181
181	1	2	123048	179	180	-

Table D.5: Percentages of Cypriot teachers who had been influenced more than definitely and those who had been influenced less than definitely by the following six factors, median, mean, standard deviation and responses which are similar to the normal distribution

No.	Factors Influenced Maths classroom	% teachers who were influenced less than defin/ly*	% teachers who were influenced strongly**	Median	Mean	S.D	Normal Distr.
1	Views of my colleagues	21.6	27.5	3.00***	3.03	0.83	Yes
2	Headteacher's view	20.9	39.6	3.00	3.00	0.89	Yes
3	Parents' views	79.2	2.7	2.00	1.84	0.85	N.A.
4	Pupils' views	29.3	33.1	3.00	3.03	1.03	Yes
5	Inspector's view	10.8	60.5	4.00	3.60	0.87	Yes
6	Policy documents	7.0	74.0	4.00	3.91	0.86	N.A.

* = This group of teachers has been either not influenced or influenced only a little
** = This group of teachers has been either strongly or very strongly influenced
*** = 1: No influence at all; 2: Only a little influence; 3: A definite influence; 4: A strong influence; 5 = A very strong influence.

Table D.6: Percentages of Cypriot teachers who would like to be influenced more than definitely and those who would like to be influenced less than definitely by the following six factors, median, mean, standard deviation, and responses which are similar to the normal distribution

No.	Factors influence Maths classroom	% teachers influenced: less than defin/ly*	% teachers influenced: strongly**	Median	Mean	S.D	Normal Distrib.
1	Views of my colleagues	15.7	41.6	3.00***	3.27	0.92	Yes
2	Headteacher's view	13.5	52.4	4.00	3.47	0.92	Yes
3	Parents' views	63.8	9.2	2.00	2.08	1.05	Yes
4	Pupils' views	21.3	49.7	3.00	3.40	1.11	Yes
5	Inspector's view	7.7	67.5	4.00	3.80	0.96	N.A.
6	Policy documents	4.9	77.7	4.00	4.10	0.91	N.A.

* = This group of teachers would like to be influenced only a little or not at all
** = This group of teachers would like to be influenced either strongly or very strongly
*** = 1: No influence at all; 2: Only a little influence; 3: A definite influence; 4: A strong influence; 5 = A very strong influence.

Table D.7: Agglomeration schedule using Ward method for Cypriot teachers' responses to item 33 concerned with the extent to which six items influenced their Mathematics classroom

Stage	Clusters Comb/ed		Coeffic.	Stage Clust. 1st Appears		Next Stage
	Clust.1	Clust.2		Clust.1	Clust.2	
160	7	29	245	117	131	164
161	5	66	253	151	95	173
162	13	32	263	155	149	169
163	22	48	272	140	134	168
164	7	11	284	160	126	167
165	8	17	298	150	142	177
166	1	44	312	152	158	174
167	7	77	327	164	147	177
168	10	22	341	144	163	171
169	13	28	358	162	153	173
170	2	73	376	156	101	172
171	4	10	395	146	168	176
172	2	45	415	170	157	175
173	5	13	443	161	169	174
174	1	5	475	166	173	176
175	2	3	516	172	159	178
176	1	4	563	174	171	179
177	7	8	615	167	165	178
178	2	7	700	175	177	179
179	1	2	850	176	178	-

Table D.8: Agglomeration schedule using Ward method for Cypriot teachers' responses to item 35 concerned with the extent to which they would like to be influenced by six items

Stage	Clusters Comb/ed		Coeffic.	Stage Clust. 1st Appears		Next Stage
	Clust.1	Clust.2		Clust.1	Clust.2	
160	10	15	247	154	144	169
161	12	23	255	139	147	165
162	8	33	263	145	152	173
163	54	110	273	146	133	171
164	4	20	283	136	141	171
165	12	22	295	161	137	173
166	7	9	307	150	156	174
167	13	30	321	157	158	172
168	2	73	336	159	142	175
169	1	10	352	149	160	170
170	1	11	374	169	155	180
171	4	54	398	164	163	177
172	13	29	424	167	148	176
173	8	12	450	162	165	175
174	7	26	479	166	151	176
175	2	8	526	168	173	179
176	7	13	581	174	172	177
177	4	7	646	171	176	178
178	4	16	738	177	153	179
179	2	9	852	175	178	180
180	1	4	1046	170	179	-

Table D.9: Agglomeration schedule using Ward method for Cypriot teachers' responses concerned with the extent to which they were influenced by each of the three factors derived from Factor Analysis on their responses to item 33

Stage	Clusters Comb/ed		Coeffic.	Stage Clust. 1st Appears		Next Stage
	Clust.1	Clust.2		Clust.1	Clust.2	
160	6	9	154	133	142	168
161	2	7	163	146	151	169
162	1	80	172	154	136	171
163	47	117	182	144	0	173
164	3	18	192	145	132	174
165	11	44	205	159	0	166
166	11	25	221	165	124	175
167	4	8	239	158	141	174
168	6	20	260	160	156	170
169	2	17	287	161	140	173
170	6	23	321	168	152	172
171	1	13	357	162	155	175
172	6	10	396	170	153	176
173	2	47	439	169	163	177
174	3	4	492	164	167	176
175	1	11	566	171	166	178
176	3	6	674	174	172	177
177	2	3	864	173	176	178
178	1	2	1114	175	177	-

Table D.10: Responses of Cypriot teachers who attended three years initial teachers training course and have less than 10 years of experience and those who have more than 10 years of experience to item 32 concerned with documents used for planning their Mathematics lessons.

Mainly used for planning Maths lessons	Up to 10 years experience		More than 10 years experience	
	Frequen.	Percent.	Frequent.	Percent.
New Curriculum	4	5.2	9	24.3
Triminiaia (Non-Statutory guidance)	20	26.0	7	18.9
Textbooks	50	64.9	21	56.8
Other	3	3.0	0	0.0
Did not respond	0	0.0	0	0.0
	-----	------	-----	-------
Total	77	100.0	37	100.0

Table D.11: Values of Kolmogorov Smirnov two sample test derived from comparisons between perceptions of groups of Cypriot teachers according to the size of their classes for which there are statistically significant differences

No	Perception about	Comparing perceptions of teachers who taught at single age classes with less 20 Vs. more 30 k-S Z	p	max.differ	less 20 Vs. 21 up to 29 k-S Z	p	max. differ.	21 up to 29 Vs. more 30 K-S Z	p	max.differ
1)	Manageable the New Curriculum	1.04	.05	-.12	1.16	N.A.	N.A.	1.46	.03	+.26
2)	Ease of unstruct observation	1.31	.04	-.30	1.12	N.A.	N.A.	1.33	.05	+.22
3)	Confidence about teaching Maths	1.02	.06	-.19	.43	N.A.	N.A.	1.55	.01	+.15
4)	Confidence about assessment in Maths	1.11	.05	-.22	.27	N.A.	N.A.	1.49	.02	+.27
5)	Smaller class size as way of improving	1.39	.04	+.31	1.14	N.A.	N.A.	1.02	.06	-.13

Table D.12: Perceptions of Cypriot teachers who teach at single age classes with less than 20, 21 up to 30, and more than 30 pupils about pupils' self-assessment

Opinions about pupils' self-assessment	Cypriot teachers who taught at single age classes with					
	less than 20 pupils		21 up to 30 pupils		More than 30 pupils	
	Frequen.	Percent.	Frequent.	Percent	Frequent.	Percent.
Agreed	8	25.8	34	43.0	27	61.4
Disagreed	8	25.8	15	19.0	8	18.2
I do not know	15	48.4	30	38.0	9	20.5
Total	31	100.0	79	100.0	34	100.0

Table D.13: Frequencies and percentages of teachers who teach pupils of year 6 and those who teach at any of the other five year groups according to their opinion about the importance of the summative purpose of assessment.

Opinions about summative purpose	Teachers of Year 6		Teachers did not teach Year 6	
	Frequen.	Percent.	Frequent.	Percent.
Most Important	1	3.57	0	0.0
Next most important	4	14.29	6	3.97
Least or the next least important	23	82.14	145	90.06
Total	28	100.00	151	100.00

Table D.14: Frequencies and percentages of teachers who teach the youngest pupils (Year 1 and Year 2) and those who teach the oldest pupils (Year 5 and Year 6) of the primary school according to their opinion about the use of pupils' self-assessment as method of assessment

Opinions about self-assessment	Teachers of Youngest Pupils		Teachers of oldest Pupils	
	Frequen.	Percent.	Frequent.	Percent.
Agreed	19	33.33	22	57.89
Disagreed	11	19.30	5	13.16
I do not know	27	47.37	11	28.95
Total	57	100.00	38	100.00

Table D.15: Means, and standard deviations of the perceptions of Cypriot teachers who teach the youngest and those who teach the oldest pupils as well as the t-values derived from comparing perceptions of these two groups

Perceptions	Teachers of Youngest* pupils			Oldest** pupils			T	Degr. of	p
	Freq.	Mean	S.D.	Freq	Mean	S.D.	Value	freedom	
1) Time spend in Group Work	69	19.41	12.02	51	26.32	13.14	-2.99	118	.003
2) Influenced from Parents	69	1.73	0.89	50	2.16	0.87	-2.58	117	.011
3) Would like to be influen. by parents	69	1.94	1.03	51	2.43	1.10	-2.50	118	.014

* = The group of teachers who teach at classes with pupils of either year 1 or year 2
** = The group of teachers who teach at classes with pupils of either year 5 or year 6

Table D.16: Frequencies, and percentages of groups of Cypriot teachers according to the number of different year groups in their classes who use the following for planning their mathematics lessons

Documents used for planning	Teach single classes			Teach two year groups*			More than 2 year groups		
	Freq.	Perc.	Val. Perc.	Freq.	Perc.	Val. Perc.	Freq.	Perc.	Val. Perc.
New Curriculum	34	20.9	21.0	2	14.3	14.3	0	0.0	0.0
Triminiaia (Non-Statutory guidance)	30	18.4	18.5	6	42.9	42.9	4	40.0	40.0
Textbooks	96	58.9	59.3	6	42.9	42.9	4	40.0	40.0
Other	2	1.2	1.2	0	0.0	0.0	2	20.0	20.0
Did not respond	1	0.6		0	0.0		0	0.0	
Total	163	100.0	100.0	15	100.0	100.0	10	100.0	100.0

* Teachers who have in their classroom pupils of two different year groups

Table D.17: Frequencies and percentages of Cypriot teachers who teach at schools with high attainers and well educated parents and those who teach at schools without such pupils and parents according to their opinion about the use of pupils' self-assessment as method of assessment

Opinions about self-assessment	Schools with High attainers		Schools with low attainers	
	Frequen.	Percent.	Frequent.	Percent.
Agreed	9	81.82	12	31.58
Disagreed	0	0.00	13	34.21
I do not know	2	18.18	13	34.21
Total	11	100.00	38	100.00

Table D.18: Degree of consensus among the staff (teachers) of each of the five schools, the among teachers of the general sample of Cypriot teachers, the beginning teachers.

Group of teachers	Purposes of Mathematics (k=4)				Purposes of assessment (k=4)			
	W*	S**	n***	p	W	S	n	p
School A	.536	526.9	8	.005	.826	610.3	8	.001
School B	.487	502.7	8	.006	.556	540.2	8	.003
School C	.418	551.8	10	.005	.786	937.9	10	.001
School D	.436	575.5	10	.005	.486	506.9	9	.003
School E	.433	571.6	10	.005	.794	961.5	10	.001
General sample of Cypriot teachers	.313	264232	185	.001	.742	988776	185	.001
Cypriot Beginning Teachers	.233	292366	98	.001	.788	6263904	98	.001

* Kendal's coefficient of concordance was considered to be the most suitable measurement of consensus
** Sum of squares of the observed deviations from the mean of R_j
*** members of each group who responded to the relevant items

Table D.19: Frequencies and percentages of members of each school who belong at each of the six types of the clusters created using the ward method in their responses to the item 31, concerned with classroom organisation

clusters: Schools	Type I		Type II		Type III		Type IV		Type V		Type VI	
	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.
School A (N=8)	2	33.3	1	11.1	3	25.0	2	20.0	0	0.0	0	0.0
School B (N=9)	2	33.3	1	11.1	0	0.0	5	50.0	0	0.0	1	16.7
School C (N=9)	1	16.7	1	11.1	3	25.0	0	0.0	4	57.1	1	16.7
School D (N=10)	1	16.7	2	22.2	2	16.7	1	10.0	2	28.6	3	42.9
School E (N=12)	0	0.0	4	44.5	4	33.3	2	20.0	1	14.3	1	16.7
Total of cluster	6	100.0	9	100.0	12	100.0	10	100.0	7	100.0	6	100.0

Table D.20: Frequencies and percentages of members of each school who belong at each of the six types of the clusters created using the ward method in their responses to the item 33 concerned with factors influenced their practice

clusters: Schools	Type I		Type II		Type III		Type IV		Type V		Type VI	
	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.
School A (N=8)	1	14.3	5	31.3	1	16.7	1	14.3	0	0.0	0	0.0
School B (N=9)	1	14.3	1	6.3	0	0.0	4	57.1	2	33.3	1	14.3
School C (N=10)	2	28.6	3	18.3	3	50.0	0	0.0	0	0.0	2	28.6
School D (N=10)	0	0.0	6	37.8	0	0.0	1	14.3	3	50.0	0	0.0
School E (N=12)	3	42.8	1	6.3	2	33.3	1	14.3	1	16.7	4	57.1
Total of cluster	7	100.0	16	100.0	6	100.0	7	100.0	6	100.0	7	100.0

Table D.21: Frequencies and percentages of members of each school who belong at each of the six types of the clusters created using the ward method in their responses to the items concerned with factors they want to be influenced in an ideal case

clusters: Schools	Type I		Type II		Type III		Type IV		Type V		Type VI	
	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.
School A (N=8)	2	25.0	1	16.7	4	20.0	1	33.3	0	0.0	0	0.0
School B (N=9)	1	12.5	2	33.3	3	15.0	0	0.0	2	22.2	1	33.3
School C (N=10)	1	12.5	0	0.0	6	30.0	1	33.3	2	22.2	0	0.0
School D (N=10)	0	0.0	1	16.7	6	30.0	1	33.3	2	22.2	1	33.3
School E (N=12)	4	50.0	2	33.3	1	5.0	0	0.0	3	33.3	1	33.3
Total of cluster	8	100.0	6	100.0	20	100.0	3	100.0	9	100.0	3	100.0

Table D.22: Frequencies and percentages of members of each school who belong at each of the five types of the clusters created by computing the Kendall's tau coefficient in their responses to the items concerned with purposes of teaching and assessment in Mathematics

clusters schools:	Type I		Type II		Type III		Type IV		Type V	
	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc
School A (N=8)	1	6.2	1	12.5	1	25.0	1	33.3	4	22.2
School B (N=9)	5	31.3	3	37.5	0	0.0	0	0.0	1	5.6
School C (N=10)	4	25.0	0	0.0	1	25.0	1	33.3	4	22.2
School D (N=10)	0	0.0	3	37.5	1	25.0	1	33.3	5	27.8
School E (N=12)	6	37.5	1	12.5	1	25.0	0	0.0	4	22.2
Total of cluster	16	100.0	8	100.0	4	100.0	3	100.0	18	100.0

Table D.23: Frequencies and percentages of beginning teachers and those of the general sample according to their opinion about the use of pupils' self-assessment as method of assessment

Opinions about self-assessment	Beginning Teachers Frequen.	Percent.	General sample of Teachers Frequent.	Percent.
Agreed	32	32.7	77	44.0
Disagreed	13	13.3	38	21.7
I do not know	53	54.1	60	34.3
Total	98	100.00	38	100.0

Table D.24: Frequencies and percentages of Cypriot and English beginning teachers about teaching Mathematics mainly through practical investigations

Opinions about investigations	Cypriot beginning Teachers Frequen.	Perc.	Valid perc.	English beginning teachers Frequent.	Perc.	Valid Perc.
Agreed *	79	78.2	79.8	22	45.9	48.8
Disagreed **	4	4.0	4.0	16	33.3	35.6
I do not know/I am not sure	16	15.8	16.2	7	14.6	15.6
Did not respond	2	2.0	missing	3	6.3	missing
Total	101	100.0	100.0	48	100.0	100.0
	Median: 4.00***	Mode: 4.00		Median: 3.00	Mode: 4.00	

* = This group of teachers either agree or absolutely agree
** = This group of teachers either disagree or absolutely disagree
*** = 1: I absolutely disagree; 2: I disagree; 3: do not know/I cannot say; 4: I agree; 5: I absolutely agree

Table D.25: Means, and Standard Deviations of time in Mathematics lessons that pupils of each of the four clusters of English beginning teaches and of the Whole Group of English beginning teachers spent in working on individual tasks, collaborative group tasks and as a whole class respectively.

Group of Teachers (Number)	Individual Tasks Mean	S.D.	Working as a Whole Class Mean	S.D.	Collaborative Tasks Mean	S.D.
Type I (N=18)	56.11	5.30	22.11	11.64	21.78	12.17
Type II (N=9)	74.78	7.01	8.11	5.16	17.11	6.03
Type III (N=6)	26.67	11.69	16.67	6.06	56.67	13.66
Type IV (N=5)	22.00	9.08	54.00	15.16	24.00	10.84
Whole Group (N=38)	53.79	21.21	21.28	16.99	26.44	17.67

Table D.26: Means, and Standard Deviations of time in Mathematics lessons that the children of each of the four clusters of Cypriot beginning teaches and of the Whole Group of Cypriot beginning teachers spent in working on individual tasks, collaborative group tasks and as a whole class respectively.

Group of Teachers (Number)	Individual Tasks		Working as a Whole Class		Collaborative Tasks	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Type I (N=18)	25.50	8.25	56.72	4.52	16.67	6.41
Type II (N=52)	9.58	7.09	78.31	8.63	12.87	8.54
Type III (N=20)	14.25	11.84	45.50	15.04	36.75	10.42
Type IV (N=5)	25.00	15.00	94.60	4.50	41.00	18.84
Whole Group (N=95)	14.39	10.95	68.49	18.05	20.09	14.05

FIGURE D.1: Dendrogram produced by the Ward's Clustering Method based on teachers' responses on Item 31 (Classroom Organisation)

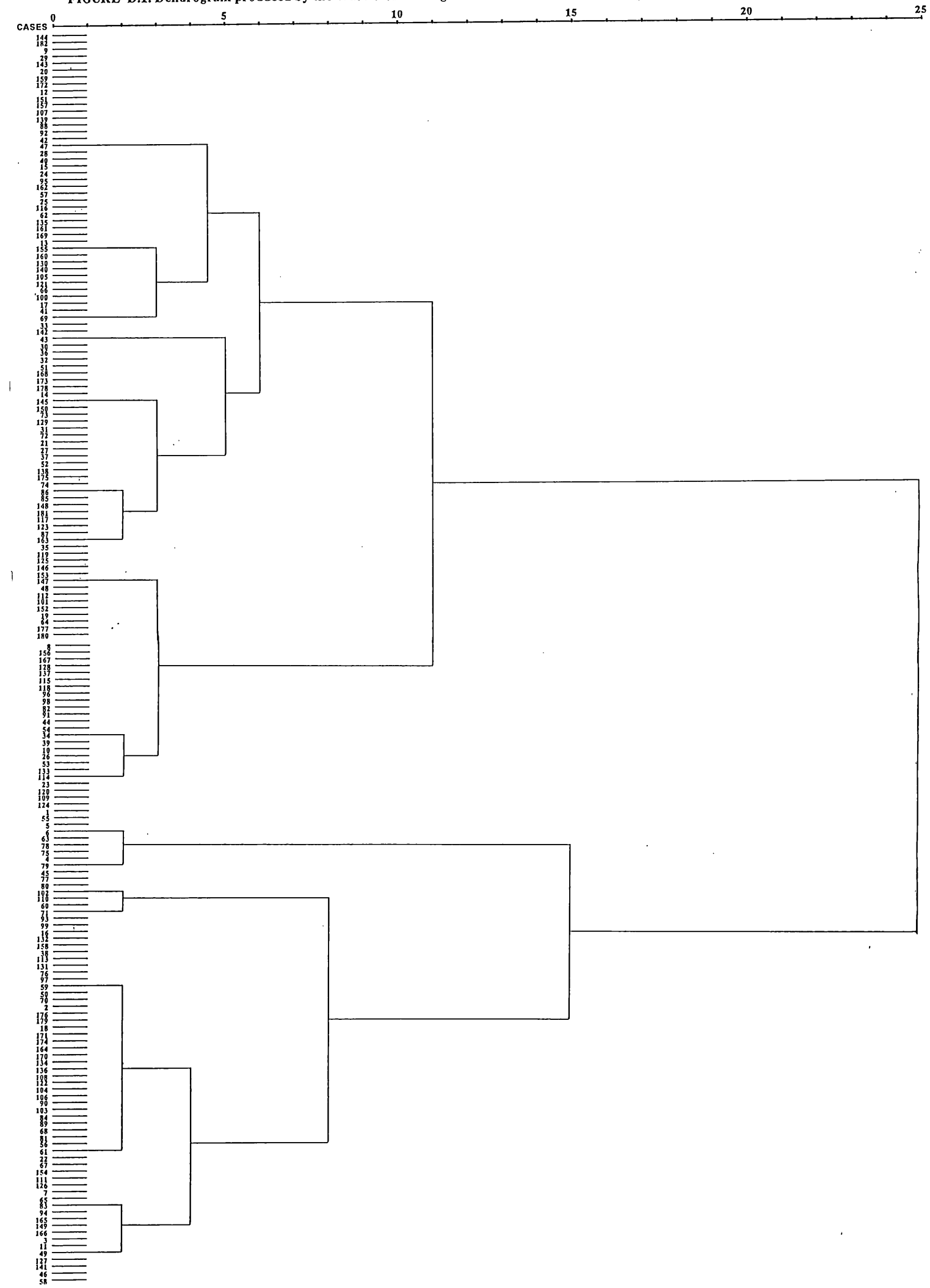


FIGURE D.2: Dendrogram produced by the Ward's Clustering method based on teachers' responses on Item 33

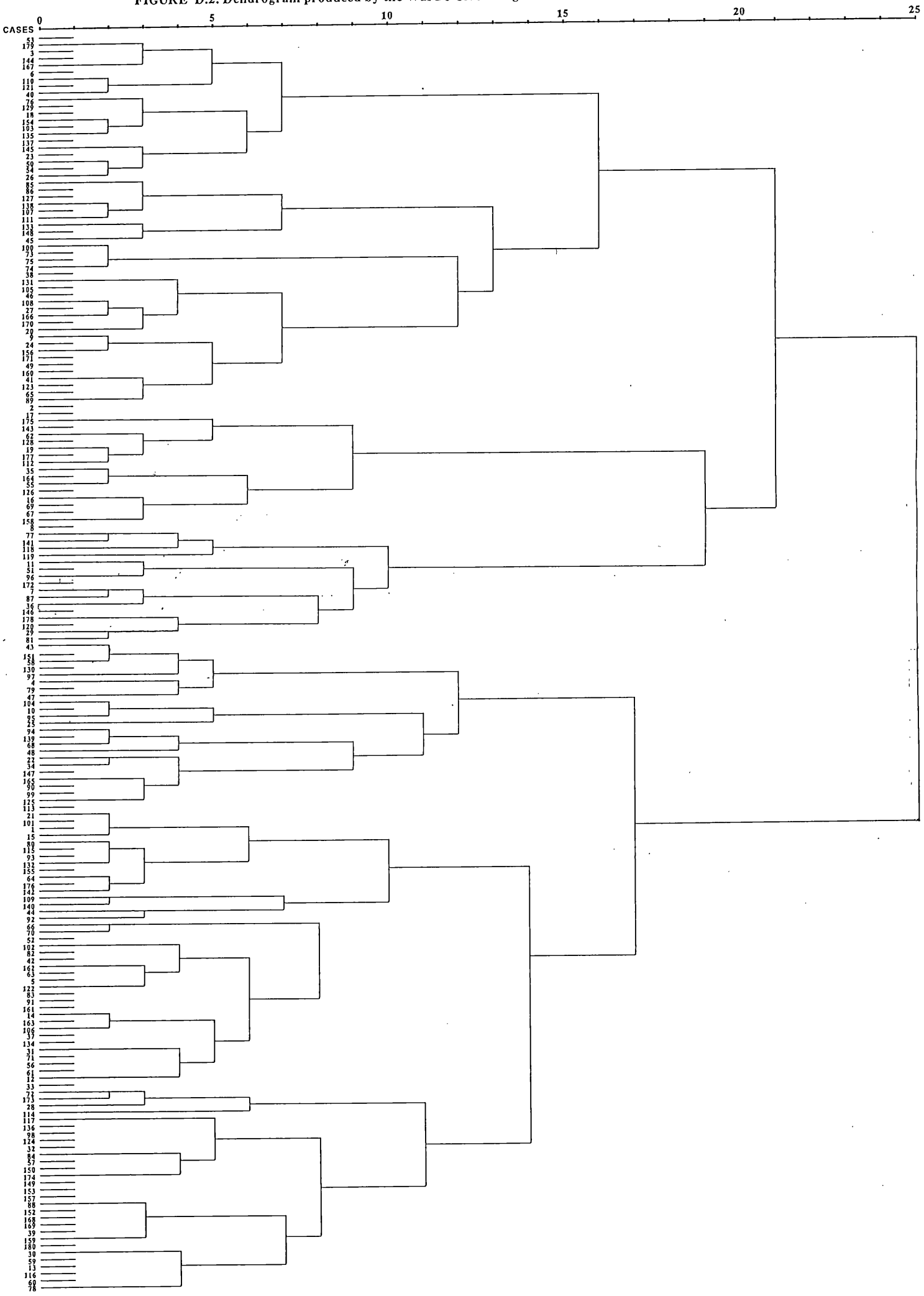


FIGURE D.3: Dendrogram produced by the Ward's Clustering Method based on teachers' responses on Item 34

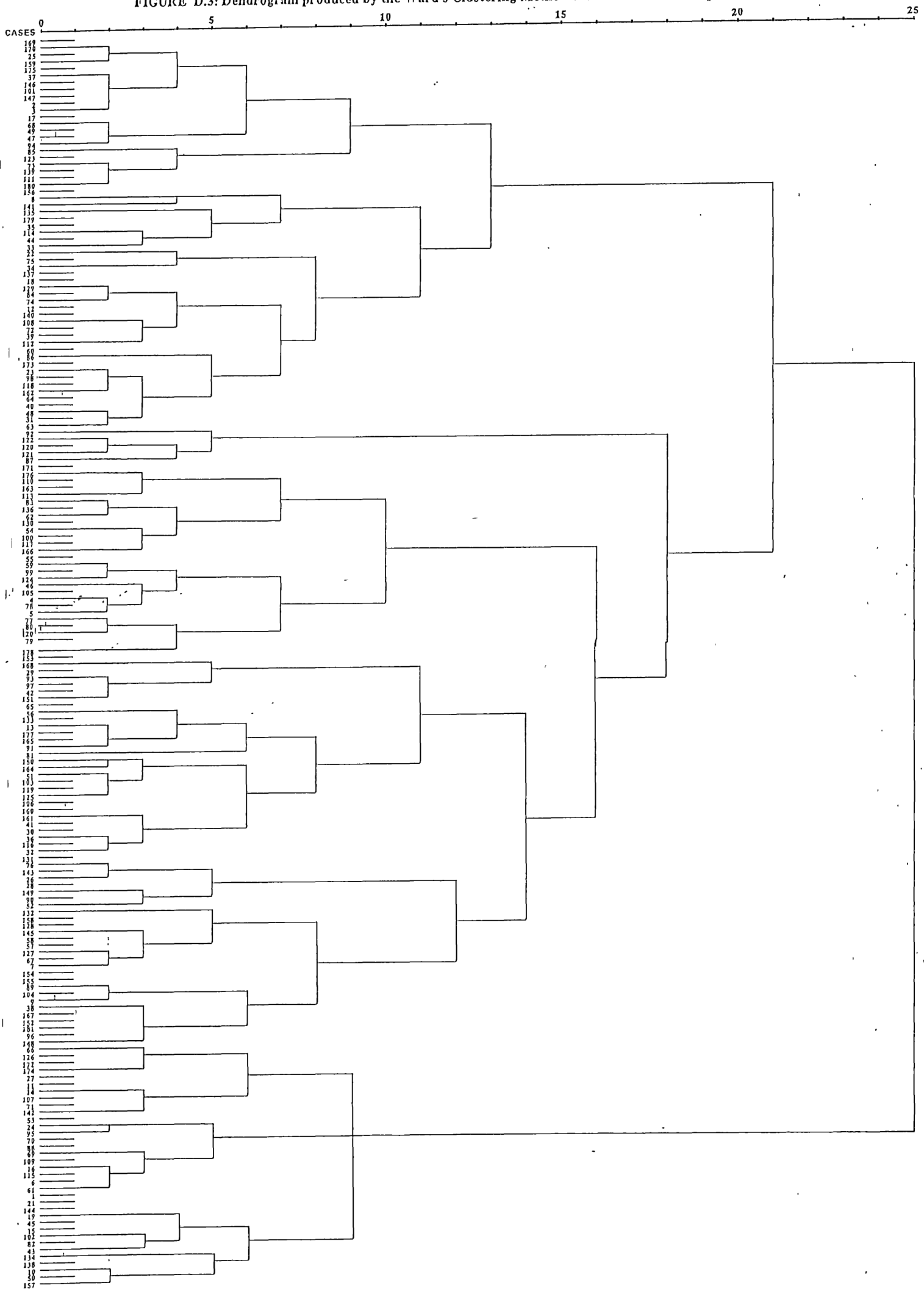
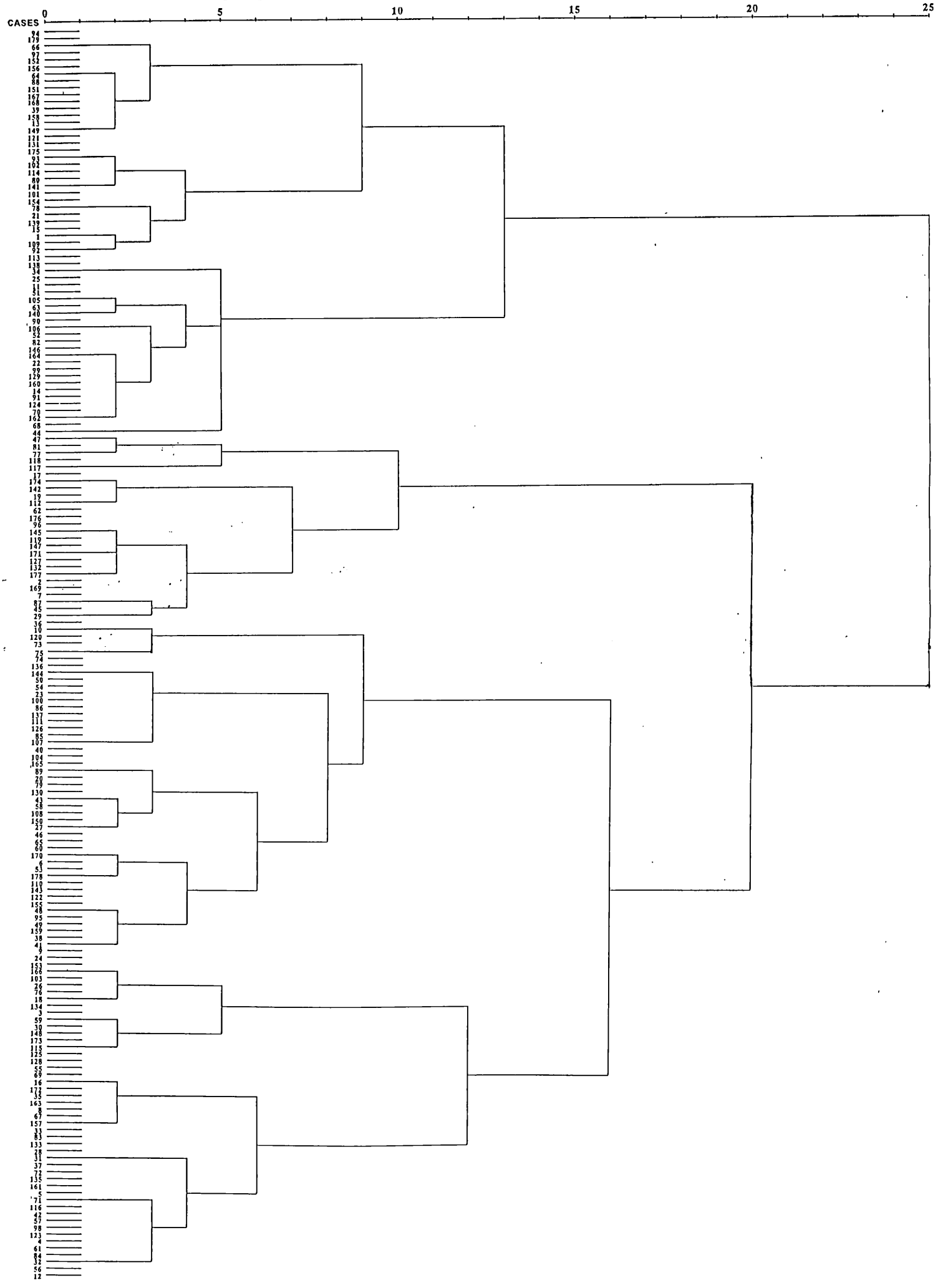


FIGURE D.4: Dendrogram produced by the Ward's Clustering Method based on teachers' responses on Item 33 (Factor Analysis)



Appendix E: Documentary Research in Five Primary Schools of Cyprus

The purpose of documentary research focused on five primary schools was to examine whether school based curriculum development had taken place in any of these schools, and to trace possible influences of school policy on teachers' perceptions. However, analysis of the records of the staff meetings of these five schools and the fact that teachers of these schools did not produce any document concerned with mathematics pedagogy or assessment, revealed that they did not systematically attempt to develop a school policy. The following 12 issues were raised by analysing the reports of the staff meetings of these schools:

1) Teachers did not discuss about anything but routine problems (e.g. when to organise a trip, how to clean the school, etc) in most of the staff meetings, irrespective of the school where they worked. Issues directly or indirectly related to teaching or assessment were discussed in less than seven staff meetings of each of these schools (Table E.1). In addition, teachers' discussion about such issues did not lead them to any decision on how they could put into practice the requirements of the New Curriculum. This can be identified below.

2) Discussion about aspects of teaching Mathematics during these staff meetings did not lead them to any conclusion on how they could teach Mathematics according to the requirements of the New Curriculum and/or the special characteristics of their school.

Table E.1: Frequencies and percentages of the kind of issues discussed in the staff meetings of five primary schools in Cyprus

Kind of Issues	School A	School B	School C	School D	SchoolE
Pedagogy	4(12.5%)	2 (6.2%)	1 (3.1%)	3 (9.4%)	2(7%)
Assess/ment	2 (6.2%)	1 (3.0%)	1 (3.1%)	1 (3.1%)	0(0%)
Co-ordinators	0 (0%)	1 (3.0%)	1 (3.1%)	0 (0%)	0(0%)
Co-operation	0 (0%)	1 (3.0%)	0 (0%)	0 (0%)	0(0%)
School-based INSET	0 (0%)	0 (0%)	1 (3.1%)	0 (0%)	0(0%)
Routine only	26(81.3%)	28(84.8%)	28(87.5%)	28(87.5%)	28(93%)
Total	32(100%)	33(100%)	32(100%)	32(100%)	30(100%

3) Teachers of three schools (A, C and D) decided that they should give written tests at the end of each semester. In addition, the head of school D designed tests for classes of each year group. However, neither he nor any other head attempted to analyse the information gathered from these tests, in order to identify the needs of their pupils. They kept them in a file in order to be able to show to their inspectors that assessment took place in their school. However, they did not treat them as evidence of pupils' abilities in Mathematics which could influence their approaches in teaching Mathematics.

4) Teachers of two schools (B and D) indicated that officials of the Ministry of Education should define the basics of the New Curriculum, in order to identify the concepts which they should teach to the whole group of

pupils and others which may only teach to the high attainers. However, they did not try to identify what they should teach to the whole group of their pupils. In addition, they did not decide that they could give differential tasks to their pupils.

5) Schools did not take any decision on record-keeping. It is, therefore, very unlikely that they took into account the judgements of those who used to teach their pupils in the previous year about their abilities.

6) Although co-ordinators of mathematics were appointed in two schools (B and C), their role was not made explicit by any report of the staff meetings or any other school document. In addition, reports of the staff meetings revealed that co-ordinators did not illustrate to their colleagues methods of teaching Mathematics. They did not also help them to solve their difficulties with teaching and assessment in Mathematics, either.

7) A report of staff meeting in school C was the only one which raised suggestions about a kind of "school-based" INSET. It was argued that teachers who attended INSET courses at P.I. could present to others what they have been taught, so that their colleagues could become better teachers. However, there was no document revealing that any teacher of this school presented anything related to any of the course he/she had attended.

8) There was not any report of the staff meeting or any other document indicating practical suggestions which could promote collegiality and co-operation. However, teachers of the same year group at school B had a common time at which

they were free from class contact and could make their week plan. They had to agree on what they should teach each week.

9) There was not any report or other document dealing with the idea of visiting the classes of other teachers. Thus, teachers had never observed any of their colleagues in order to discuss with them about the advantages of the lesson which they observed and how it could become better. It is however important to put down the comments of head of school A about my questionnaire:

> "I think that I get the meaning which is behind of this questionnaire. I agreed that heads should do something to change the current system. Thus, I decided to present to my teachers a lesson and I will ask them to observe it and try to find out its advantages and how it could become better. If you want you can come. I will be very happy if you observe this and tell me how I can make this better"

10) Although these five schools had beginning teachers, teachers of these schools did not take any decision on how they could help them to face the difficulties they found with teaching and assessment.

11) Teachers of school D raised in three of their meetings issues concerned with curriculum policy in Cyprus and criticised the way decisions were taken. It was also accepted that they did not use either the curriculum or the guidelines ("triminiaia") in order to plan their lessons.

12) Finally, none of these schools designed any scheme or any other curriculum material which they could use to teach mathematics. However, three schools (C, D and E) had a small library which had some books concerned with the Mathematics pedagogy (e.g. Williams and Shuard 1982) and some English schemes (e.g. Let's Explore, Mathematics

Today). Nevertheless, teachers told me that they did not use them.

The validity of this analysis could be questioned, since it is a search of primary sources. However, I presented to the heads of these schools the findings of this documentary research and asked them to tell me if they agreed with me. I asked heads because they are the ones responsible for the organisation of the school. They agreed with this analysis and accepted that they did not take any decision on how they should teach Mathematics.

APPENDIX F
Policy documents published by the Ministry of Education since 1988 used to analyse the Curriculum Policy in Cyprus

Ministry of Education (1989) Letter of Director of Primary Education to the Representative of the British Council in Nicosia Nicosia, Ministry of Education File YP 223/68/7 5th June 1989

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Appendix G: Findings from Unstructured Interviews with Cypriot teachers

The content of the questionnaire was affected not only by the review of the literature but also by unstructured interview with 20 teachers. The purpose of these interviews was to gain some insight into the perceptions of the interviewees about issues they considered as crucial for their practice, in order to include these issues in the questionnaire. Thus, the interviewees imposed the agenda of the interviews which was loosely unstructured. The approach followed was therefore similar to that described by MacDonald and Sanger (1982) as "tactical opportunism" in order to provide me "the kind of information is available" (ie. professional dilemmas).

The 20 interviewees were an opportunistic sample of teachers whom I met in August 1991. I had a friendly conversation with them which was gradually focused upon their experiences of teaching, in order to identify educational issues and their professional dilemmas. At the end of these conversations I asked them to allow me to use data gathered by these interviews. The purpose of these informal conversations and issues identified from their interview, were also provided. All of them allowed me to use information gathered by interviews and agreed with my interpretation of their interview, and four of them provided issues not mentioned in the interview which they also considered as *important for the agenda of a research* on curriculum reform in Cyprus.

The main consequences of these interviews for the design of the questionnaire were the following: First, Item 29 related to the effectiveness of INSET was included in the questionnaire because from the interviews it became clear that this was an important issue for Cypriot teachers. This finding was affirmed by the review of the literature concerned with the role of INSET for the process of change. Second, the content of Items 33 and 34, concerned with the factors influencing teachers' perceptions and the factors which teachers wanted to be able to influence them, was affected by the findings of these interviews. This influence was in terms of taking into account heads', parents' and inspectors' role. Similar findings, concerned with the notion of curriculum control (inspectors' role) the notion of links between home and school (parents' role) and the role of head for school based curriculum development, were identified by the review of the literature. In addition, the stratified sampling procedure followed for the selection of the five schools used in this study was affected by these interviews in terms of taking into account the socio-economic background and heads' interest in Mathematics.

Third, findings concerned with the use of cross-curricular approach, confirmed the need to take this issue into account so it was included in the questionnaire as previously. Fourth, the issue of curriculum organisation was identified as particularly crucial for the case of Mathematics and this affected the content of Item 31a, b, and c of the questionnaire. The need to identify what actually happens rather than what teachers believe should happen was derived

also from these interviews. Thus, instead of having the Item 18 of the previous questionnaire (Kyriakides 1992), concerned with their perceptions about the ideal way of curriculum organisation, it was decided to ask teachers what they actually did in their class. Fifth, the need for considering the issue of curriculum time as way of improving assessment was also identified. This had implications for the content of Item 37.

Sixth, Item 32 on how teachers plan their mathematics lesson was included because of these interviews. The interview findings indicated that teachers used textbooks for their planning rather than the curriculum, as was seen in the review of the literature also. Finally, Item 28 referring to teachers' role in the process of decision-making, was supported by both the review of the literature and these interviews.

The use of both the review of the literature and interviews for the design of the questionnaire can be seen as a kind of triangulation, since findings from one were checked by findings from the other.